HEATING AND VENTILATING

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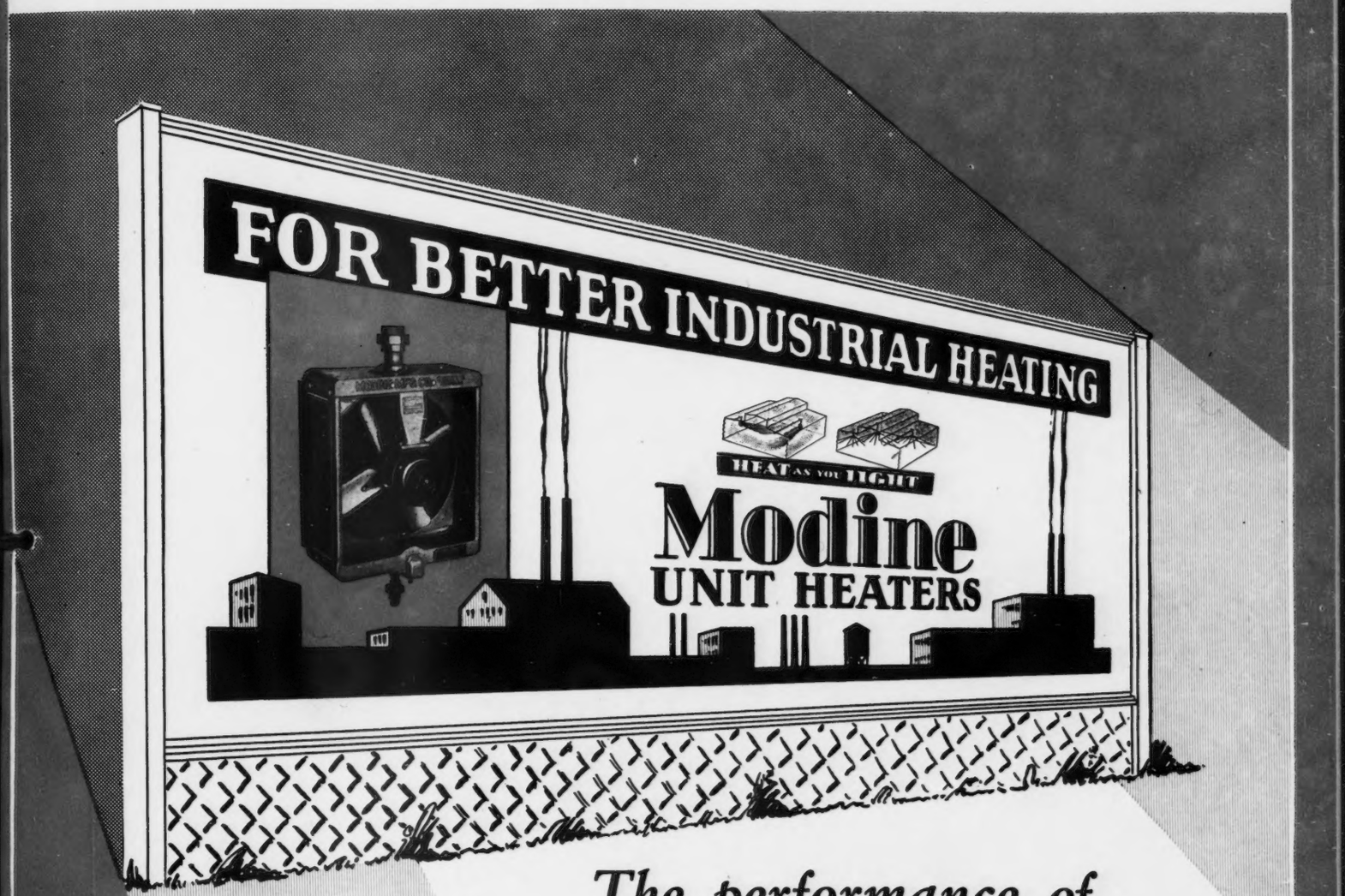


Four of the eight Models

Model 1401—Replaces 1300 sq. ft. of pipe coil radiation — weight 300 lbs.

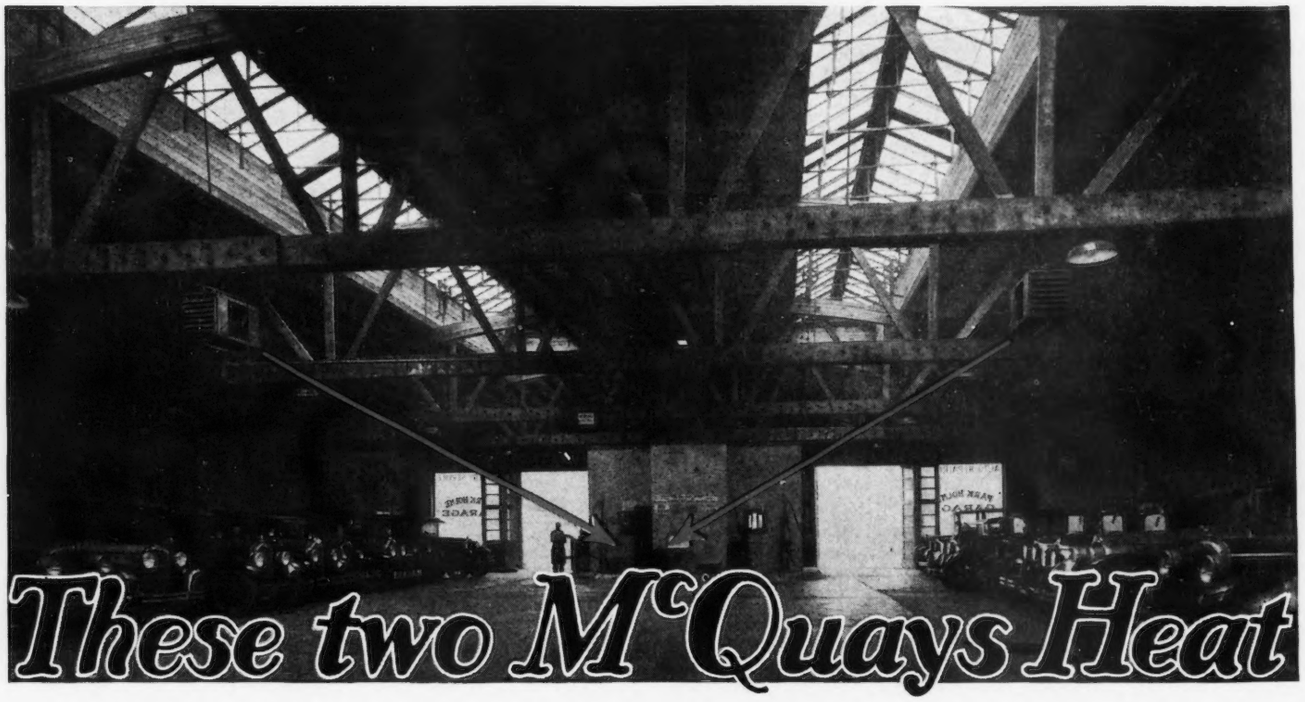
Model 701 — Replaces 700 sq. ft. of pipe coil radiation — weight 130 lbs.

Model 301 — Replaces 300 sq. ft. of pipe coil radiation — weight 75 lbs.

Model 153 — Replaces 150 sq. ft. of pipe coil radiation — weight 40 lbs.

The performance of
Modine Unit Heaters
has secured the endorsement of those who demand the utmost in heating economy!

MODINE MANUFACTURING COMPANY
(Heating Division)
1707 RACINE STREET RACINE, WIS.
Branch Offices in all Large Cities.
London Office: S. G. LEACH & CO., LTD., 26-30 Artillery Lane.



19,000 Square Feet

This entire building—150 by 125 feet—is heated with just two McQuay Unit Heaters. Think of the tremendous amount of piping and radiators required to heat the same space with old-time methods. And with old-time methods a big share of the heat would be wasted *up* into the skylights. With McQuay all the heat is *driven down to the floor where it is needed.*

Each of the heaters drive heated air 75 feet in both directions—offsetting the large heat losses thru the wide doors and skylights.

McQUAY

UNIT HEATERS

In factories, large stores, garages, etc., McQuay Units provide the best and most economical way of heating.

They cost less to install, and less to operate; because all the heat is sent down into the "working areas." Also they provide *instantaneous heat.* Turn on the heat and the fan and immediately a flood of heated air starts to circulate.

Quickly installed in any building by any recognized Heating Contractor who will quote prices and specifications.

McQuay Unit Heaters are made in sizes equivalent to from 50 to 2000 square feet of cast iron radiation.

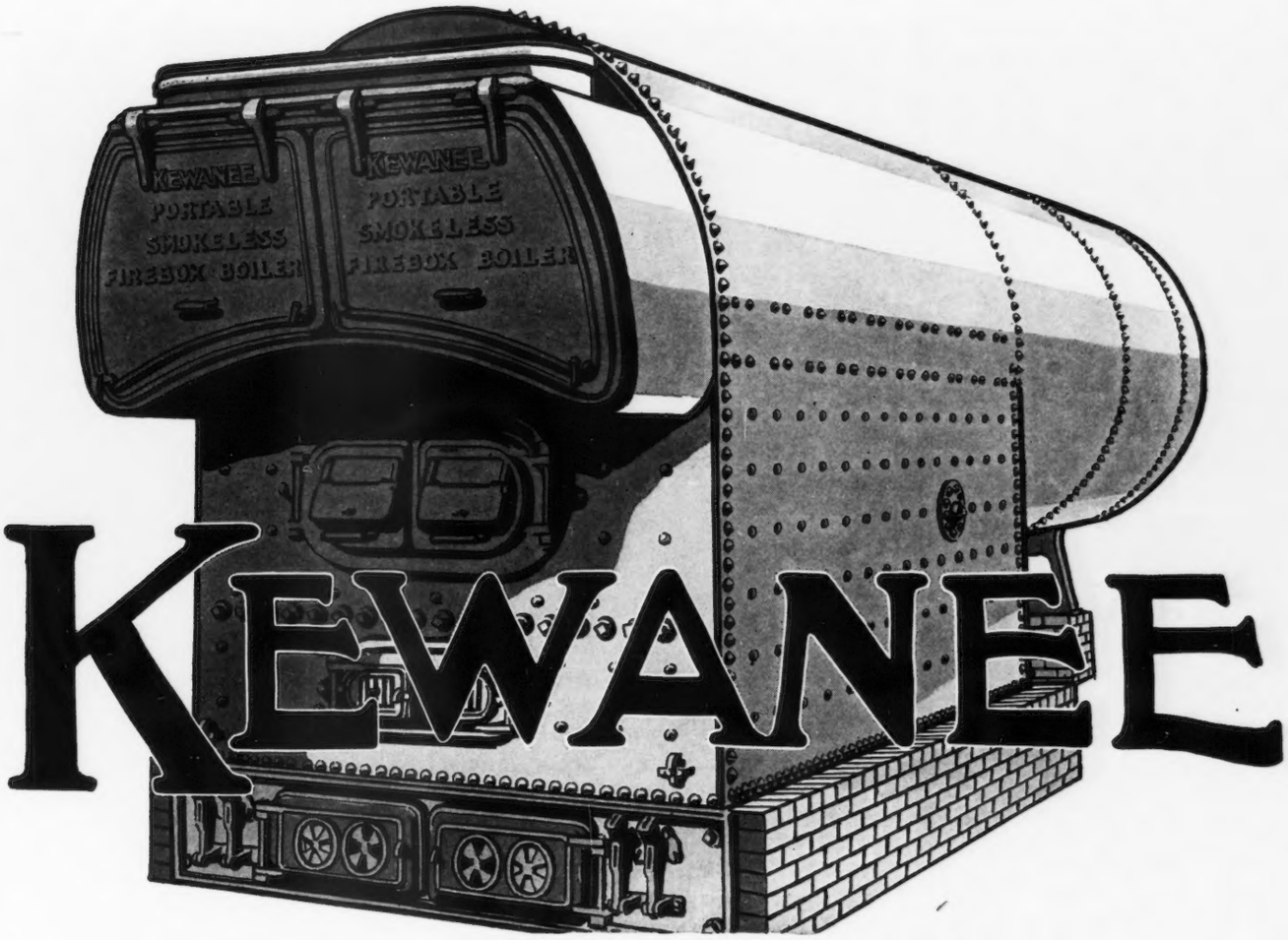
Tubes are seamless copper, swaged and welded into a copper header giving an equal expansion and contraction, and eliminating possibility of leaks that occur when tubes and headers are of different materials. The specially designed flat tubes permit free passage of air.

Our Engineering Department is at your service to assist in designing of drying and condensing equipment to meet any particular needs.

McQUAY RADIATOR CORPORATION

General Offices: 35 East Wacker Drive, CHICAGO

Branches in Principal Cities



KEWANEE

61 Years *of* Boiler Building . . .

during all of which the trend has been definitely towards steel . . . have taught us that to give an owner the service he wants from a boiler, we must put certain things into it.

Kewanee has always built with that thought in mind. The result is that every Kewanee is of unquestioned value . . . a boiler that is a real asset in any building investment.

KEWANEE BOILER CORPORATION

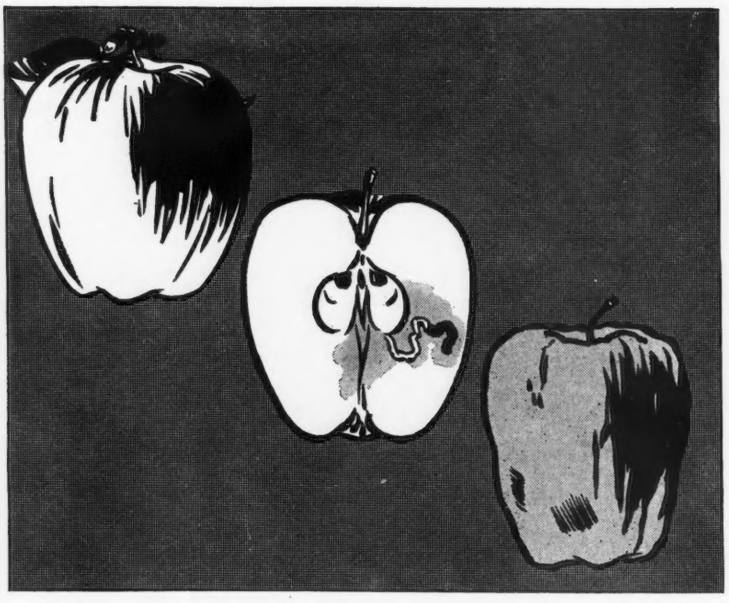
division of
American Radiator and Standard Sanitary Corporation

Kewanee, Illinois

Branches in 40 Principal Cities

HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL BUILDING PUBLICATIONS, Division of NATIONAL TRADE JOURNALS, INC., at 521 Fifth Ave., New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXVI, No. 11, November, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y. under the Act of March 3, 1879. Copyright, 1929, by NATIONAL TRADE JOURNALS, INC.

The old fruit packers' rule that one bad apple may spoil a barrel is kept in mind in building Pacific Steel Boilers. Tell-tale staybolts are one precaution against any hidden weakness.



Never a hidden flaw

As a worm hidden in the heart of one apple may spoil not only that apple but an entire barrel, one hidden flaw can threaten an entire boiler. In full recognition of this fact, every detail of Pacific Steel Boilers is planned and built.

Take the tell-tale staybolt construction as an example. If you could look down into one of the water chambers that surround the four sides of the Pacific's fire box, you would see rows of bolts, like rows of corn in a field. They are of steel and overstrong, with ends welded into the plates.

Ordinarily enduring for years, under abnormal operating conditions one of these bolts may occasionally break. Then, if there is nothing to warn, an additional burden is shifted to those that remain, weakening them. If a sufficient number break, the wall plate sags or buckles, necessitating costly repairs.

In the Pacific, rather than being solid as in the ordinary boiler, each staybolt has a tell-tale hole drilled in each end. If a bolt parts, a warning jet of water spurts out, calling for a simple replacement that any repair man can make.

Thus, with the tell-tale staybolt construction used in locomotives, Pacific Steel Heating Boilers make assurance doubly sure of low repair costs and long service. There is a Pacific installation for your building. Write for full information.

PACIFIC

STEEL HEATING BOILERS

AND CAPITOL RADIATORS MAKE A LOGICAL COMBINATION

STEEL HEATING BOILERS · PACIFIC · WAUKEGAN ILLINOIS

PACIFIC STEEL BOILER CORPORATION

Factories: Waukegan, Ill., Bristol, Pa.

Sales Offices in 58 Cities

Division of United States Radiator Corporation, Detroit

The 4425 Sheridan Apartments at Sheridan Rd. and Galt. St., Chicago.
Architect, Roy F. France & Co., Chicago, Ill.
Consulting Engineer, Arthur S. Grossberg, Chicago, Ill.
Heating Contractors, Schampel & Dougherty, Inc., Chicago, Ill.

Judge boilers *by these* 10 POINTS of Superiority

1—Unrestricted circulation.

2—Smokeless.

3—Unusually large direct heating surface.

4—Full length self-cleaning convex crown sheet.

5—Tubes easily cleaned from outside.

6—One large body of water.

7—Indestructible smokeless arch with circulating baffles.

8—Large central flue.

9—All seams electrically arc welded—tubes expanded in heads.

10—Three-pass fire travel.

Write for Catalog—Ideal for Oil or Gas Burning.

The Frost
MANUFACTURING COMPANY
Galesburg . Illinois

Dealers in Most Leading Cities.

ROSS STEEL BOILERS

COATESVILLE BOILERS

Architects
THOMAS MARTIN KIRKPATRICK
Engineer and Construction Manager
DAY & ZIMMERMAN
Heating Contractor
TRENTON PLUMBING & HEATING CO.

NECHO ALLEN HOTEL
POTTSVILLE, PENNSYLVANIA

BEACH HOTEL
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Architects
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Heating Contractor
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Architects
THOMAS MARTIN KIRKPATRICK
General Contractor
WARK CO.
Heating Contractor
BURNS, LANE & RICHARDSON

WOODROW WILSON HOTEL
NEW BRUNSWICK, NEW JERSEY

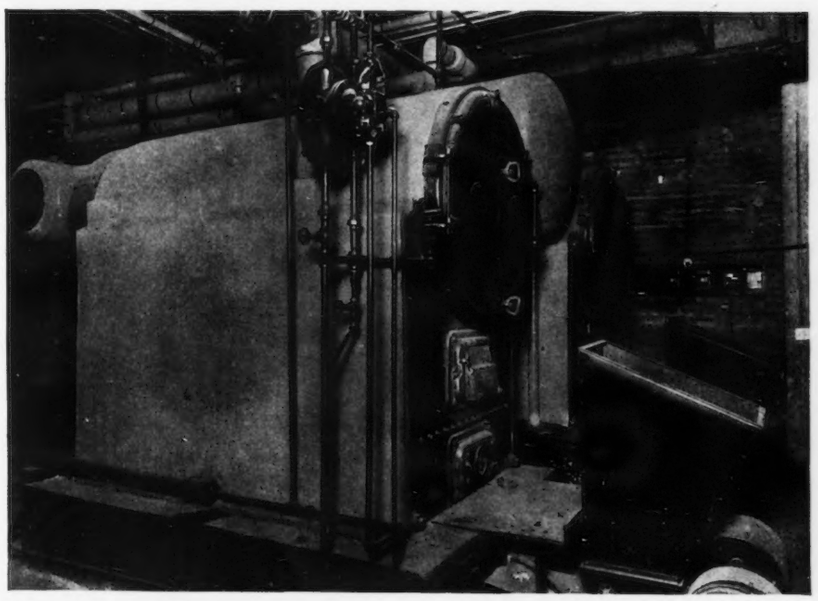
Hotels Endorse Coatesville Steel Boilers

Men who design and plan hotels realize Coatesville Steel Heating Boilers assure uninterrupted heating service, an absolute necessity for comfort of guests.

Coatesville installations have enjoyed recognition and prestige as a result of nearly a half-century of faithful performance.

COATESVILLE BOILER WORKS
Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.



Two McDonnell & Miller Self-Cleaning Duplex Feeds installed on Pacific Boilers equipped with "Iron Firemen." W. S. Adams, Heating Contractor; R. N. Hunt, Architect.

The most *vital* job in the boiler room

WHAT job in a boiler room compares in importance with maintaining the proper water level in the boiler? What job asks as big a penalty for failure to handle it properly?

This matter of watching the water line is the easiest thing for a man to overlook—the last thing that should be trusted to the slender, easily snapped thread of human memory. It is a job for a mechanical device with a memory of cast iron and bronze!

—and the *toughest* job

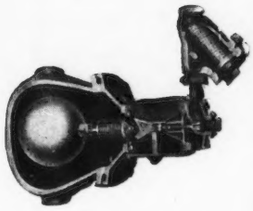
Even when handled mechanically, the maintaining of the boiler water line is a tough job. That is why we have said repeatedly that "only the best boiler feeder is good enough." When the circuit to the condensation pump fails, the feeder you specify or install must be capable of feeding the entire feed water requirements of the boiler. It must do this always—even when the water is hard or rank. Isn't this a job that should only be entrusted to a *self-cleaning* feeder—a feeder with rotary valves that "stay new"?

A Practical Necessity With Automatic Firing

On the oil or gas fired job the boiler water line problem looms still bigger. Automatic firing encourages neglect of the water line. What protection against this neglect is quite so logical and effective as the McDonnell & Miller Self-Cleaning Duplex Feeder. It not only protects the boiler from low water, but also protects the owner and tenants from shut-downs of the burner and the trouble, and expense that always accompanies shut-downs. This fact is each day taking deeper root. Many prominent engineers are insisting that every oil or gas fired job be equipped with a McDonnell & Miller Self-Cleaning Duplex Feeder.

Send the coupon for facts.

McDONNELL & MILLER, 1314 Wrigley Bldg., Chicago
Eastern Office: Grand Central Terminal Bldg., New York, N. Y.



Now a lower priced feeder for smaller boilers

The New McDonnell No. 30 Safety Feeder is made for protecting the smaller boiler against low water. Its lower price is due to the smaller size and ingenious simplicity. Use the coupon to request facts about it.

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

McDonnell & Miller,
1314 Wrigley Bldg.,
Chicago.

Please send facts covering feeders checked:
McDonnell & Miller Self-Cleaning Duplex Feeders.
McDonnell Safety Feeder.

Business.....

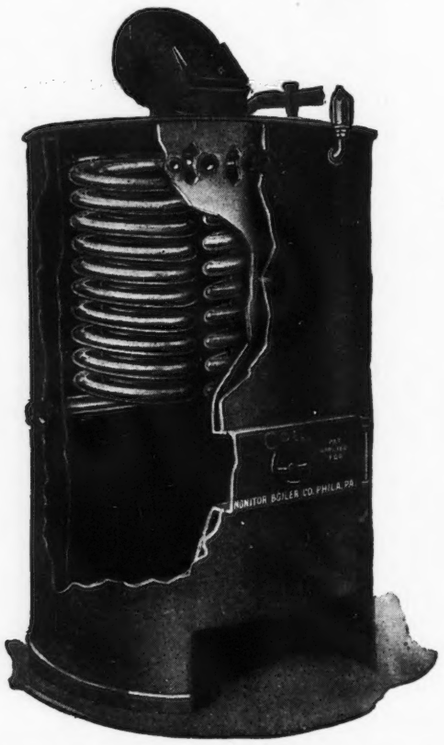
Individual.....

Street and Number.....

City and State..... HV-11

COIL

STEEL HEATING BOILERS AND WATER HEATERS



We will be glad to send you complete detailed information about Coil Boilers. Merely send us your letterhead or business card.

Hundreds of letters from Heating Contractors the country over attest Coil Boiler superiority.

FOR OIL BURNING

Coil Boilers have been developed up to their present high standard of efficiency only after years of constant effort. With the advent of oil as a heating fuel medium, the Coil Boiler, because of its advanced design, was found ideal for this type of work.

It affords a much greater area of heat absorbing surface to the living flame and because of this, not only does a better job of heating but effects savings in fuel hardly thought possible.

MONITOR BOILER COMPANY

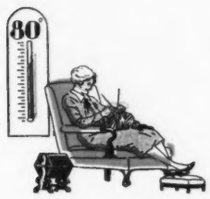
1505 Race Street :: :: Philadelphia, Pa.

don't sell cast iron

sell Made-to-Measure Warmth

Playroom

Bed Rooms



Grandma's Room

Bath Room

Living Room

Somebody's FINALLY DONE SOMETHING ABOUT THE WEATHER . . .

"Everybody *talks* about the weather," complained Mark Twain, "But nobody *does* anything about it." Enjoyed for all these years, the jest now loses point; for someone *has* finally done something about the weather. The "Something" is the New National *Made-to-Measure* Heating System. The "Someone"—in your locality—can be you.

Your shop can be Heating Headquarters for your neighborhood. You can be known as the man to see for the Newest Ideas in modern heating. All this through National's New *Made-to-Measure* Warmth Idea, and National's Sales and Advertising Cooperation, that supplements and reinforces all your selling effort.

The National *Made-to-Measure* Warmth Idea helps you *interest* prospects. The National Boiler Bond helps you *convince* prospects; the performance of the boiler is specified and guaranteed. You are protected against criticism or complaint.

The National Protective Payment Plan helps you close prospects. The customer pays in installments, while protected by insurance covering death or disability. You get your money in full, when the job is completed.

Write for complete and helpful information on this outstanding idea, these outstanding sales plans. If you haven't a National Bonded Direct Cast Iron Radiation booklet, we'd like to send you one.

NATIONAL RADIATOR CORPORATION

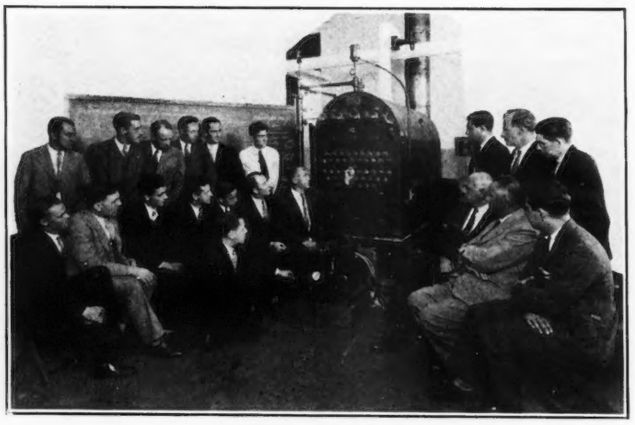
***Executive Offices:* 55 West 42nd Street, New York, N. Y.**

NATIONAL

Made-to-Measure HEATING SYSTEMS

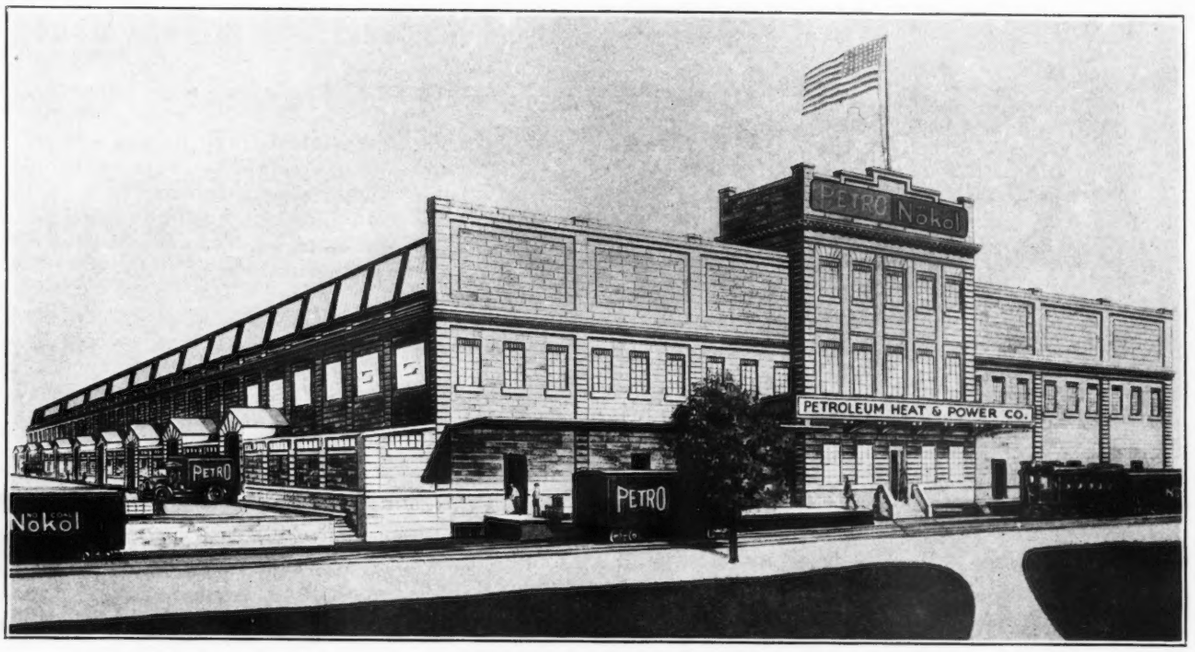
Copyright 1929
National Radiator
Corporation

PETRO-Nokol (NO COAL) uses a Triple-Service for its Sales and Service School ~



The world's largest oil burner company found the International TRIPLE SERVICE the ideal boiler to train its salesmen and service men in the proper sales and operation of its oil burner equipment.

Let us tell you more about the TRIPLE SERVICE boiler which furnishes heat, hot water and incineration in one unit economically and efficiently.



THE INTERNATIONAL BOILER WORKS CO.

EAST STROUDSBURG, PA.

THERMO SERVICE, Inc.
101 Park Ave., New York City

Distributors

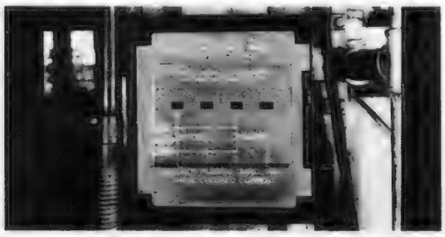
HEATING EQUIPMENT CORP.
1194 Commonwealth Ave., Boston, Mass.

Lighting by kerosene was once good enough

So *too,* rating a heating pump merely in square feet of radiation *was once good enough.* But - - - -

Every Heating Pump Rating
should *now* be supported by
tested air and water capacities

RATINGS OF Jennings Vacuum Heating Pumps take into account the differences that occur in vacuum heating systems. They make allowance for the fact that two systems containing the same square footage of radiation seldom present the same pumping problem. A Jennings Pump with the air and water capacities given in the accompanying table serves satisfactorily any reasonably well installed system for the life of the building. And this holds true whether the system is compact or widespread . . . whether the condensate must be lifted or not . . . regardless of air leaks which may develop.

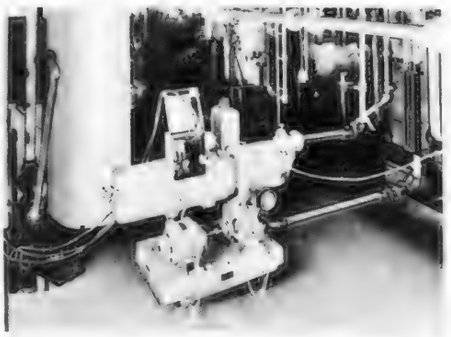


PLUG-IN BOX FROM SWITCHBOARD WHICH FURNISHES ELECTRIC CURRENT OF ANY DESIRED PHASE, VOLTAGE AND FREQUENCY

Tested Capacities Support Jennings Ratings

Before leaving the factory, every Jennings Pump undergoes an exhaustive test. In this test, the electric current furnished to the motor is of the same phase, voltage and frequency as the current to be supplied later in actual service. This is made possible by a specially built switchboard, which is the only one of its kind in use for industrial pump test purposes.

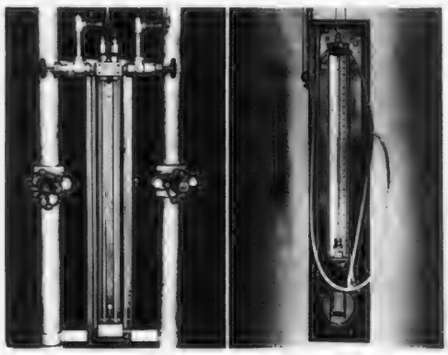
Air and water capacities are accurately determined. Horsepower is measured. Each pump is tested with its own motor and control equipment. The complete pump assembly is made to prove its fitness for the job for which it is recommended. A certified report of the test is furnished to the purchaser.



JENNINGS VACUUM HEATING PUMP ON TEST STAND

Water Capacity is Measured by a Venturi Meter

Water capacity is determined by measuring the volume of water, in gallons per minute, that the pump removes from the receiving tank *under the given vacuum* and delivers against the specified discharge pressure.



VENTURI METER AND VACUUM MANOMETER USED IN TESTING JENNINGS PUMPS

CAPACITIES OF
JENNINGS VACUUM HEATING PUMPS

Pump Size	Equivalent Direct Radiation Square Feet	Water Capacity G.P.M.	Air Capacity Cu. Ft. Per Min.	Orifice Diameter Inches	MOTOR HORSEPOWER			
					10 Lbs.	20 Lbs.	30 Lbs.	40 Lbs.
T	2,500	4	3	7/64	1/3	1/2	1	1 1/2
U	5,000	9	3	7/64	1/3	1/2	1	1 1/2
V	10,000	14	6	5/32	1	1	1 1/2	2
B	16,000	22	9	3/16	1 1/2	2	3	5
C	26,000	35	15	1/4	2	3	5	5
D	40,000	60	19	9/32	3	5	5	7 1/2
E	65,000	90	34	3/8	5	5	7 1/2	10
F	100,000	140	50	7/16	7 1/2	10	15	15
*G	150,000	200	102	9/16 & 5/16	10	15	UPON REQUEST	
*H	300,000	400	171	2-7/16 & 1-9/16			UPON REQUEST	

*The last two sizes are not of the manifold type.

Air Capacity is Measured by Calibrated Orifice

Air capacity is measured by means of a calibrated orifice of specified diameter, reamed in a brass plate one-eighth inch thick, located in the pump suction, and communicating with the receiving tank. This orifice determines the cubic feet per minute of air that the pump withdraws from the receiving tank and discharges to the atmosphere.

STANDARD TEST ORIFICE

Air capacity is determined at the same time that the pump is delivering its maximum rated volume of water. Water capacity is measured while the pump is handling its maximum rated quantity of air.

CERTIFIED REPORT OF TEST

The days of square foot ratings, like the days of kerosene lighting, are gone. Modern practice is to compare vacuum heating pumps only by their combined air and water capacities. It pays to demand a certified factory test report, and to substantiate this wherever possible by a second test on the job.

Jennings Pumps

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U. S. A.

a pencil

SAVES HUNDREDS OF DOLLARS . . . .

WRITE ... fill out the coupon in the lower corner ... takes but a few seconds of your time ... AND you will find that a mere pencil has saved you HUNDREDS of dollars!

We have a bulletin of information about the famous Stanwood Smokeless Boiler. This bulletin is No. 500. If you will but write for it, you will receive an answer to your boiler problem.

We created the Stanwood Smokeless Boiler. We built it to answer especially the demand for a super-efficient heating and power boiler. Any engineer who neglects investigation of the Stanwood is simply refusing his client the opportunity to save big money on operating expenses.

We also build horizontal tubular boilers as well as other standard types. We have been in business since 1891 ... making boilers. The Stanwood Corporation, Cincinnati, Ohio. Stanwood Smokeless Boilers are steel riveted and are built in sizes from 29 to 250 H.P. for working pressures of 15, 100, 125 and 150 lbs.

SEE OUR CATALOGUE IN SWEETS

STANWOOD SMOKELESS BOILERS.

THE STANWOOD CORPORATION,
Department D-119, Cincinnati, Ohio.

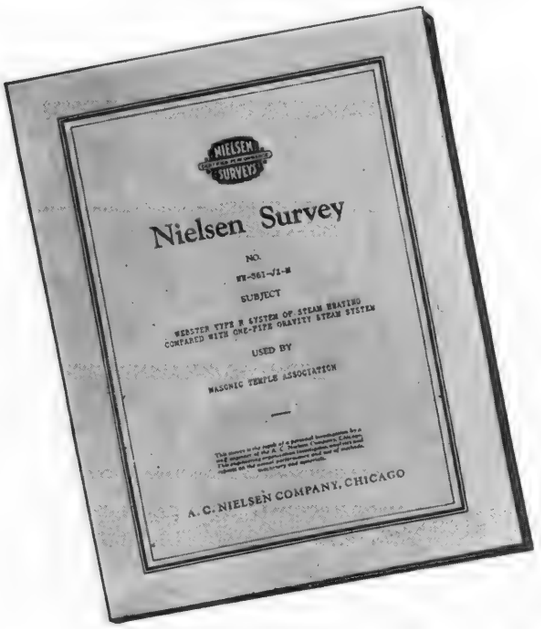
Gentlemen:.....I want Bulletin No. 500 ..... give me complete information about the famous Stanwood Smokeless Boiler.

Name.....

Address.....

City.....State.....

Interested in a boiler of.....horsepower.....pressure.



Performance Facts To Help You Close *Preferred* Business

PROGRESSIVE heating contractors who have followed this series of advertisements about the Webster Type "R" System of Steam Heating have learned of its simplicity, ease of installation, adaptability to many types of buildings and remarkable performance—all factors which make it an ideal system for the promotion of *preferred* business . . . a means of overcoming aggravating price competition. But perhaps the question has risen, "How can I convince my prospect that the Type 'R' System is worth the added cost?"

Here is conclusive evidence of performance to help you prove your case—a collection of facts showing how one Type "R" System made a saving of almost 20% or $602.19 a year by comparison with an ordinary one-pipe gravity system. This report by a firm of disinterested engineers completely covers the case, which is but one of many in which Type "R" Systems are giving comparable results.

This survey and the Webster Type "R" System Catalog make powerful material for closing the kind of *preferred* business of which we have been talking—profitable business through installations hinging on quality instead of price. Let us send you both of these interesting publications. Fill in and mail the coupon today.

-since 1888 Webster Systems of Steam Heating

The Webster Steam Heating Specialist in your vicinity can probably help you in developing PREFERRED *business with Webster Type "R" Systems. Get in touch with him.*

WARREN WEBSTER & COMPANY
Pioneers of the Vacuum System of Steam Heating
CAMDEN, NEW JERSEY
Branches in 52 principal U. S. Cities
In Canada—Darling Bros., Ltd., Montreal

a R 17HC

WARREN WEBSTER & COMPANY, Camden, New Jersey

I would be interested in receiving literature to help close *preferred* business in Webster Type "R" Systems. Send me ☐ Type "R" Catalog. ☐ Data re superiority over ordinary one-pipe system. ☐ Bulletin B-600, describing the Webster Type "R" System of Steam Heating to

HV 11-29

Name..... *Street*..... *City*.....

MARSHALL FIELD & COMPANY CHOSE ARCO METAL PIPE

FOR THEIR GREAT CHICAGO STORE

THE photograph above shows a typical Arco Metal Pipe installation now being made in Marshall Field & Company's world-famous Chicago store. The Arco Metal Pipe is being used in many cases where replacements are necessary.

Arco Metal Pipe will prevent damage, trouble and expense—it will mean permanence because it is a superior corrosion-resisting cast alloy pipe. It is made from a special nichrome alloy cast iron and cast by a process which gives it greater flexibility and tensile strength and far greater corrosion and erosion-resisting qualities than ordinary grey cast iron. And Arco Metal Pipe can be cut and threaded on the job with the same tools used on wrought steel and iron pipe.

Arco Metal Pipe is uniform in wall thickness—true to dimensions, smooth outside and inside. It is cast in vertical molds so there are no seams. Arco Metal Pipe is inexpensive and because of its long life, is actually an economy for any installation where corrosion and erosion are factors.

Arco Metal Pipe is sold by all leading wholesalers of plumbing and heating supplies. Accept no substitutes; it is readily distinguished with its coat of red paint, black stripe on one side and the name "ARCO" stenciled at intervals on the other. Ask our representative to show you a sample. Write today for information.

Arco Metal Pipe is the cast iron pipe that can be cut, threaded, and installed successfully with the same tools used on wrought steel and iron.

· ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO · ARCO ·

AMERICAN RADIATOR COMPANY

BRANCHES IN ALL PRINCIPAL CITIES

The Dunham Differential Vacuum Heating System

was selected for Seattle's outstanding new Exchange Building

Architect: John Graham, Seattle *Heating Contractor:* Rautman Plumbing & Heating Co., Seattle
Consulting Engineer: C. H. Knowles, Seattle *General Contractor:* A. W. Quist, Seattle

Occupying a commanding site in the center of Seattle's banking and financial district at Second Avenue and Marion Street, the new Exchange Building will be one of the largest, finest and most modern office buildings in the Pacific Northwest, embodying the latest ideas in architectural design, interior finish, service features and efficiency of arrangement. The vertical lines of its 23 stories predominate, emphasizing the height of the building, while the absence of pronounced horizontal projections prevents rising street noises and echoes from being caught, insuring a high degree of quiet.

The Exchange Building will house Seattle's Stock Exchange and the group of other activities known as the Merchants' Exchange. The building is within 600 feet of 11 banks containing 90% of the city's bank deposits, and fronts on two important north and south arteries, First and Second Avenues, South. The offices on the First Avenue and Marion Street sides will have the advantage of splendid marine and mountain views, the Olympic Range presenting a jagged, snow covered skyline across Puget Sound to the West and Northwest.

Service through the Exchange Building will be the finest obtainable. Nine high speed signal-controlled auto-leveling electric elevators will serve the upper floors. The building will be heated with a Dunham Differential Vacuum Heating System, with the exception of the first four floors and the blast and hot water heaters, which will operate on a Dunham Vacuum Return Line System.

To secure maximum economy in operation the Differential System is divided into four zones, the building being zoned according to exposure. Each zone has a set of Sub-Atmospheric Pressure Reducing Valves with a controlling thermostat properly located in that zone. The returns from each zone gravitate to its differential pump in the basement. There are five of these pumps installed—one for each zone and one reserve unit. The mains feeding the 818 radiators (approximately 17,300 sq. ft. on the differential system) are located in the pipe space above the sixteenth floor, feeding up to the twenty-third floor and down to the fifth floor. The Sub-Atmospheric Valves are located in this same space.

Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

EXCHANGE BUILDING

C. A. DUNHAM CO.
Dunham Building
450 East Ohio St.
CHICAGO

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone operator for the address of our office in your city. An engineer will counsel with you on any project.

PAGE Smokeless Is Fuel Saving and Law Abiding

Illustrated is the 40" Monarch Smokeless Boiler, showing three-way fire travel, auxiliary air inductor, and primary and secondary combustion chambers, recommended when it is desired to burn soft coal, or to install a boiler in which soft coal may be burned in the event of a shortage of hard coal.

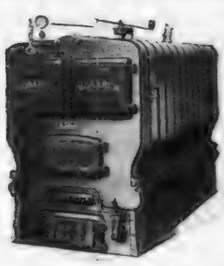
This Smokeless construction, by means of a device, simple but correct in principle, for the admission of auxiliary air over the fire, will burn the cheapest grades of soft coal without smoke, complying with the most rigid smoke ordinances, and effecting savings as high as 33-1/3%, as compared with soft coal consumption in boilers of the usual type, this without the skilled care and excessive attention required in other boilers.

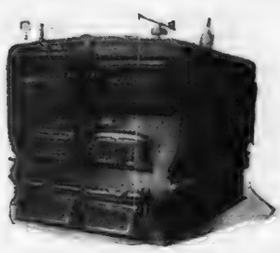
The Monarch Smokeless Boiler is but one of a most complete line of Page Boilers, for every heating need. Send for Catalogue.

The Wm H Page Boiler Co

200 Madison Ave. New York, N. Y.

Branch Offices and Warehouses:
Boston, 123 Beverly St.
Philadelphia, 1126 Washington Ave.
Cleveland, Rose Building
Factory: Meadville, Pennsylvania





Your customers will be pleased

—*and you can make money out of it*

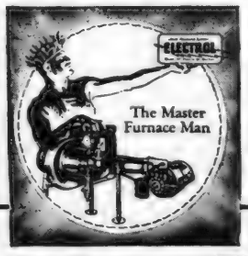
YOUR friends and customers know about Electrol's national reputation as the all-electric, entirely automatic oil burner. When it comes to oil heat, they will naturally look to you for advice and assistance. By making arrangements with the Electrol Sales and Service Representative in your city, you can extend your services to your clientele and increase your income.

You need make no investment in equipment or overhead. The Electrol dealer takes care of installations and servicing. You will find him financially and technically competent. He will gladly work with you. All you need to do is lend your cooperation, and as Electrol Automatic Oil Heat is installed in the homes of your customers, your earnings increase.

If that sounds like a fair proposition to you, meet the Electrol dealer near you and get the details from him. If you don't know his name, we'll have him get in touch with you. You two will make a good combination.

***Send for these* BULLETINS**

Heating contractors will find valuable information in two new bulletins just published by Electrol Incorporated. These bulletins are "*The Electrol Oil Burner Is Adaptable to All Types of Heating Systems*" and "*Household Heat and a Year Round Hot Water Supply with the Same Electrol Oil Burner.*"



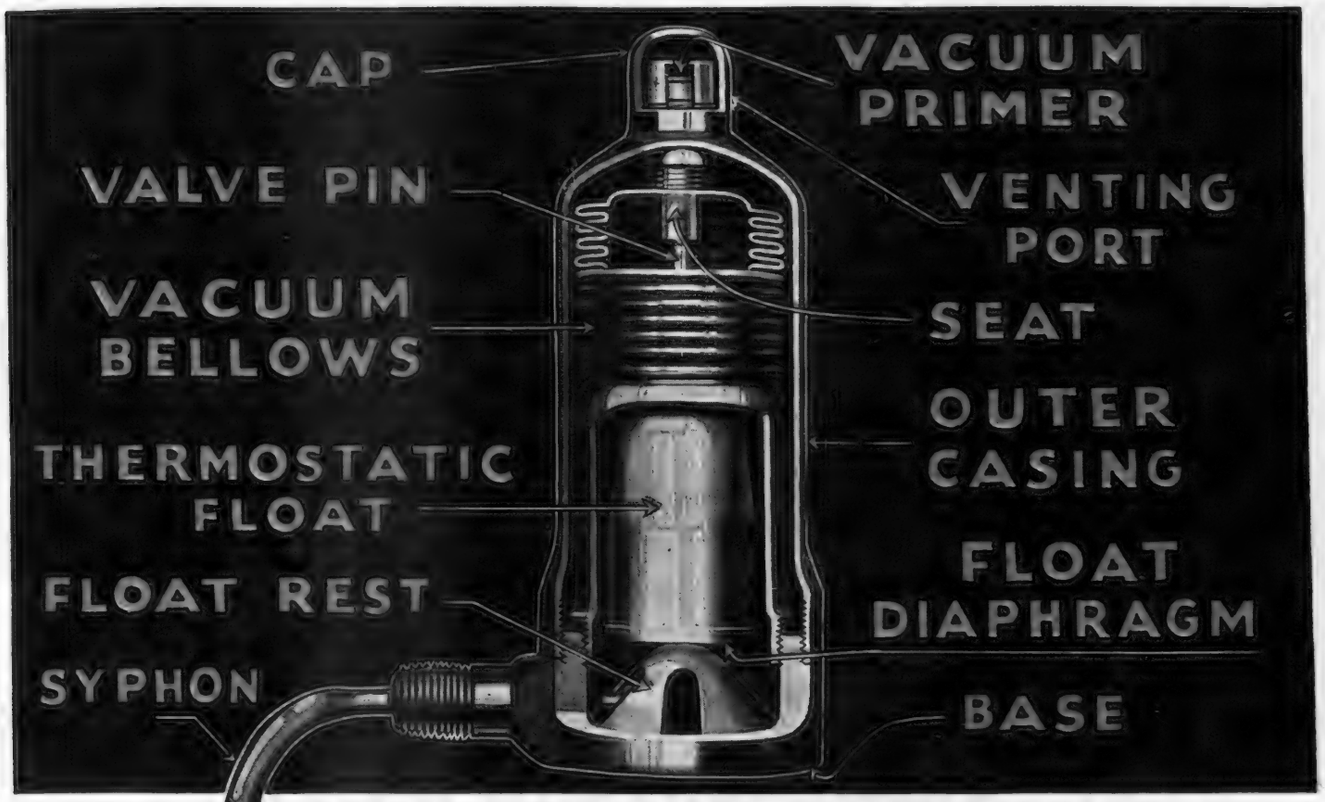
ELECTROL INCORPORATED
227 E. 45th St., New York, U. S. A.

ELECTROL

The* OIL BURNER *with the Master Control

Listed as Standard by the Underwriters' Laboratories

MEMBER OIL HEATING INSTITUTE



Patent Applied For

SELLING POINTS GALORE!

The New Dole Vacuum Valve No. 2-B

New Application of Principles—Triple-Action Construction—New Design—New Chromium Plated Finish—"Holds a Vacuum"

New—distinctive—beautifully finished—performance plus—these are the outstanding features of the new Dole Vacuum Valve No. 2-B.

Not just another vacuum valve but entirely new application of principles. Study the illustration above and convince yourself that here, at last, is the perfected vacuum valve.

Dependable Triple-Action

First, the vacuum primer, then a bellows, then a thermostatic float—this triple-action insures a positive performance. The steam is definitely sealed. The valve definitely "holds the vacuum." By actual test it has shown remarkable results. Radiators stay hot for many hours after the fire is banked. Distinct savings assured

New Design—Beautiful Chromium Plated Finish

Its good appearance suggests its splendid performance. A new and very attractive design beautifully finished in the modern way—lustrous, highly polished, non-tarnishable chromium plating. Rich, different, distinctive—completely harmonizes with any decorative scheme.

Automatic, Foolproof, Non-Adjustable

Note these facts of performance—100% automatic, non-adjustable, cannot leak water, foolproof, seat self-cleaning, syphon instantly drains away condensation, vacuum primer a sure starter, bellows design positively assures a vacuum, definitely more heat from less fuel, fewer firings, elimination of "radiator static," quick, constant, economical heat year after year. Selling points galore!

Fine Quality—Attractively Packaged

This new Dole Vacuum Valve is manufactured from the best materials. Precision workmanship throughout. Fully tested and guaranteed for five years. The valves are individually packed in smart, distinctive containers. A dozen of these nestle attractively in a display box of definite sales value. This colorful merchandising help is in keeping with the performance and appearance of the outstanding Vacuum Valve.

Prospects a-Plenty

In YOUR city are many inefficient, wasteful one-pipe steam heating systems that would be instantly corrected if equipped with these new Dole Vacuum Valves. Owners will welcome your telling them how fuel can be saved and comfort increased quickly and inexpensively.

You Be the Judge—Order Six Today

Order sufficient Dole Vacuum Valves No. 2-B (and 6-B for the mains) to make a fair test on any balky one-pipe steam system. Check results carefully—you will be amazed with their positive performance. Then you will have added confidence in campaigning your community for profitable business. One job leads to another. The low price and advantageous discounts on this unusual valve will surprise and please you.

Write NOW for complete information.

Rich, different, distinctive appearance harmonizes with any decorative scheme. Sold with a 5-year guarantee.

THE DOLE VALVE COMPANY

1913-33 Carroll Avenue, CHICAGO

From Oregon to Massachusetts PEERVENT UNITS

UNION HIGH SCHOOL MILWAUKEE, ORE.—16 PEERVENT UNITS
F. M. Stokes, Archt.
Hastorf - Lord Co.,
Heat. Contrs.
CHAFLIN DISTRICT SCHOOL NEWTON, MASS.—
Charles R. Greco, Archt.
Percy Kenway, Engr.
McClean & Cousens Co.,
Heat. Contrs.
STATE NORMAL SCHOOL LA GRANDE, ORE.
19—PEERVENT UNITS
LEVI WARREN JR. HIGH SCHOOL NEWTON, MASS.—43 PEERVENT UNITS

Bennes & Herzog, Archts.
Hastorf-Lord Co.,
Heat. Contrs.

Ripley & LeBoutillier, Archts.
Buerkel & Co., Engrs.
James S. Cassidy, Heat. Contr.

PREFERRED in schools, public and semi-public buildings and department stores, from Coast to Coast, not because PeerVent is the oldest unit but because PeerVent Heating and Ventilating Units are more efficient, less expensive and far superior to the central fan system.

Each classroom is independently ventilated although it is possible to control all from a central point. This provides service for each room at a cost proportioned to the useful work done.

PeerVent thoroughly ventilates without drafts, is absolutely quiet in operation, has no complicated mechanism, eliminates ducts and saves space.

PeerVent Units installed eighteen years ago are still in use and still working efficiently. The improved PeerVent Unit of today is backed by forty years of specialized experience in heating and ventilating.

A book has been prepared for you, fully describing the PeerVent Heating and Ventilating Units. You can get your copy for the asking.

Peerless Unit Ventilation Co., Inc.

Pioneers in Unit Ventilation

BRIDGEPORT, CONNECTICUT

Selling Agents in Principal Cities from Coast to Coast

PEERVENT

Heating and Ventilating Units

The Highest Standard of Prompt Helpful Service Surrounds Sylphon PRODUCTS

Such Service as this Is Worthy of Consideration

Fulton Sylphon Company maintains a national organization of thirty-nine sales agencies specially trained and strategically located, to render a prompt, helpful and always available service.

When you wish to discuss temperature or pressure regulation, get in touch with our representatives nearest you. You will find them eager to assist, not necessarily to secure an order but to analyze your problem and suggest a solution. Our service really begins when you first evidence an interest in Sylphon products. Should you decide to employ Sylphon Temperature or Pressure Control we aid you in making the installation, if you so desire.

The original and only genuine Sylphon Bellows.

Furthermore, just as long as you use Sylphon Instruments, *we have a genuine interest in their performance.* Our prestige in the temperature and pressure control field has been attained by the efficiency of our products and this dependable cooperation.

Every Sylphon Instrument carries a guarantee of positive, safe and efficient operation, backed by the resources of the largest manufacturer of thermostatic instruments in the world.
We invite those interested to write for fully descriptive bulletins and to submit (without obligation) problems involving Sylphon Temperature or Pressure Control.

39 *Service Points in the United States*

Atlanta	Ga.	New York	N. Y.
Baltimore	Md.	Omaha	Nebr.
Birmingham	Ala.	Philadelphia	Pa.
Boston	Mass.	Phoenix	Ariz.
Buffalo	N. Y.	Pittsburg	Pa.
Butte	Mont.	Portland	Ore.
Charlotte	N. C.	Richmond	Va.
Chicago	Ill.	Seattle	Wash.
Cincinnati	O.	Salt Lake City	Utah
Columbus	O.	San Francisco	Cali.
Cleveland	O.	St. Louis	Mo.
Dallas	Texas	Spokane	Wash.
Denver	Col.	Syracuse	N. Y.
Detroit	Mich.	Toledo	O.
Des Moines	Ia.	Wilkes-Barre	Pa.
Harrisburg	Pa.		
Indianapolis	Ind.		
Jacksonville	Fla.		
Kansas City	Mo.		
Los Angeles	Cal.		
Louisville	Ky.		
Memphis	Tenn.		
Minneapolis	Minn.		
New Haven	Conn.		

Also

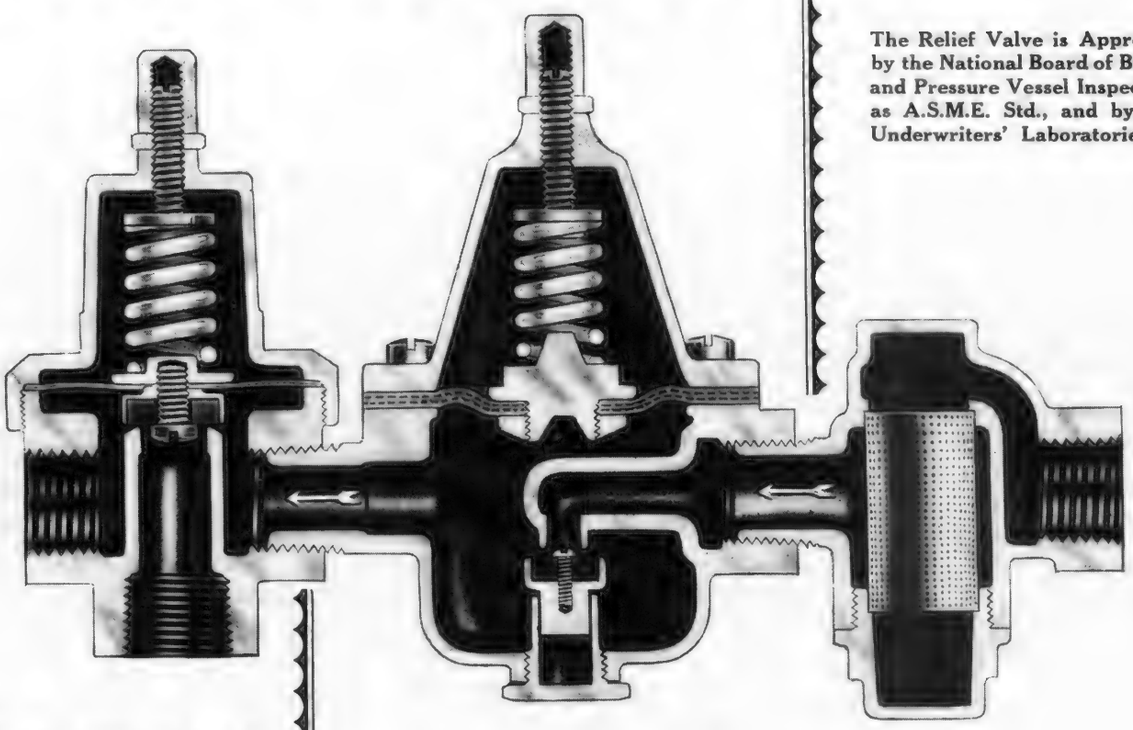
Montreal	Can.
London	Eng.
Osaka	Japan
Havana	Cuba
Manila	P. I.

Write to Department H

FULTON SYLPHON CO.
KNOXVILLE, TENN., U.S.A.

Representatives in all Principal Cities in U. S. A.—European Representatives, Crosby Valve & Eng. Company, Ltd., 41-2 Foley St., London, W. 1., England—Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada.

WATTS HOT WATER HOUSE HEATING UNIT MAKES THE SYSTEM AUTOMATIC



The Relief Valve is Approved by the National Board of Boiler and Pressure Vessel Inspectors as A.S.M.E. Std., and by the Underwriters' Laboratories.

HERE IS THE INSIDE STORY OF THE WATTS UNIT!

Note that the vital part of the Relief Valve where the disc rests on the relief chamber is up on the top, out of the flow of water.

Note the large, free water passages which allow for quicker filling of the system.

Note that the construction of the baffle plate in the Strainer precludes the possibility of collapse of the screen, and note how easily the latter can be removed for cleaning.

Note the design simplicity of the entire Unit. It is made of the very finest materials obtainable.

Write for our new discount sheet and catalog.

SALES ASSOCIATES

FOR UNITED STATES AND CANADA

JOHN G. KELLY, INCORPORATED

210 EAST 45th STREET NEW YORK CITY

SPECIAL REPRESENTATIVES

In Canada:

CUNNINGHAM & HILL, LTD., 271 West Richmond St., Toronto, Ontario.

JOHNNIE MOORE,
1020 Lawrence Ave.,
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ERNEST SANGER,
1045 Wayburn Avenue,
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HOOVER BROS. CO.,
601 State Life Bldg.,
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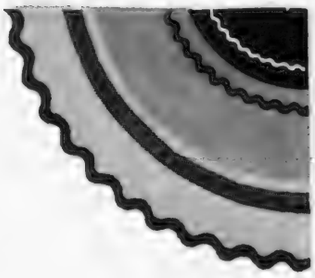
Watts Regulator Company

LAWRENCE MASSACHUSETTS



SPANG

WELDED STEEL PIPE

formerly called ETNA

is UNIFORM—
FREE CUTTING—
EASILY THREADED—
and TOUGH *yet*
DUCTILE . . .

This high grade welded steel pipe is the choice of experienced plumbers, heating contractors and pipe users everywhere. Every length is rigidly tested and scientifically inspected to the most exacting code of excellence.

The threaded ends and couplings are tested to micrometric accuracy which always assures good tight-fitting joints.

The steel is soft and ductile—yet tough and enduring. It is easy to cut—easy to thread and easy to bend—features that have made "Spang" widely popular among contractors and workmen the world over.

SPANG, CHALFANT & COMPANY, INC.

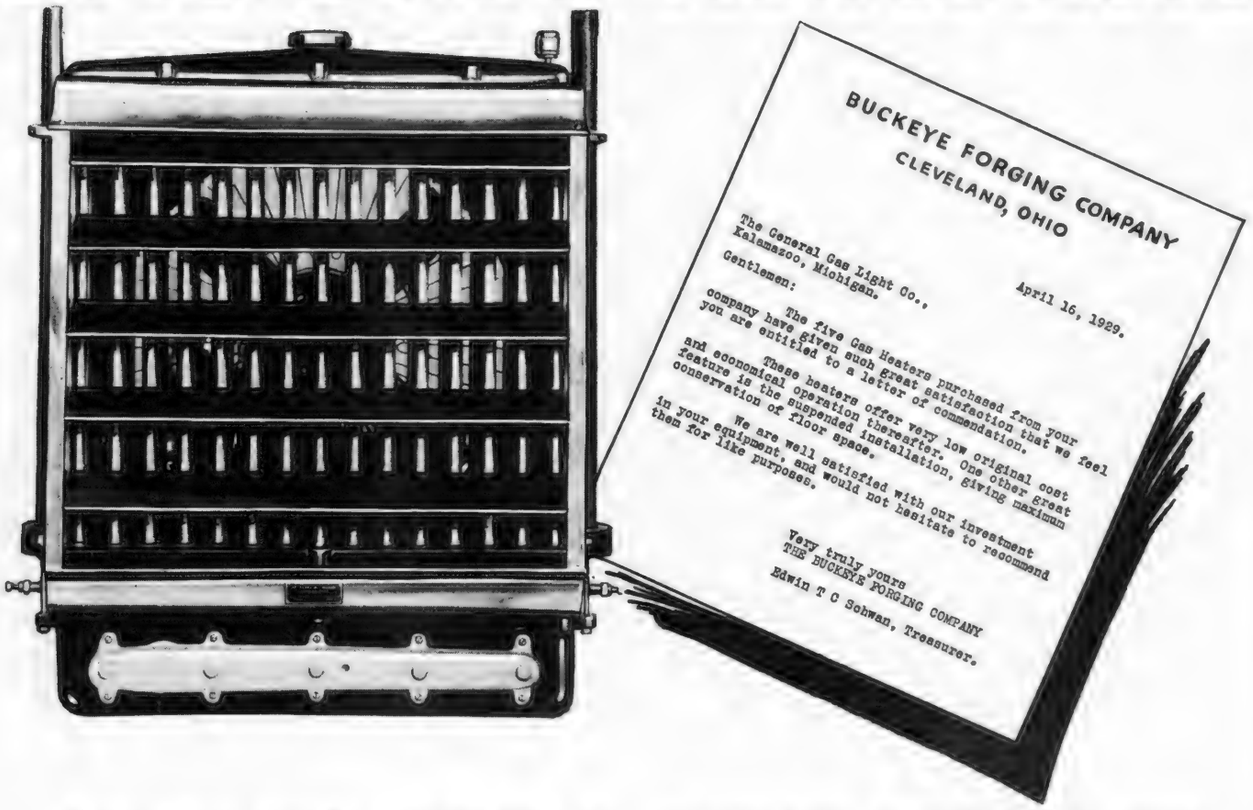
General Offices: **CLARK BUILDING, PITTSBURGH, PA.**

Sales Offices: CHICAGO, ILL. NEW YORK, N. Y. ST. LOUIS, MO. PITTSBURGH, PA.
TULSA, OKLA. LOS ANGELES, CAL.

Welded Mills: ETNA, PENNA. SHARPSBURG, PENNA.

Seamless Mills: AMBRIDGE, PENNA.

Heat entire factories with GAS UNIT HEATERS


BUCKEYE FORGING COMPANY
CLEVELAND, OHIO
The General Gas Light Co.,
Kalamazoo, Michigan.
April 16, 1929.
Gentlemen:
The five Gas Heaters purchased from your company have given such great satisfaction that we feel you are entitled to a letter of commendation.
These heaters offer very low original cost and economical operation thereafter. One other great feature is the suspended installation, giving maximum conservation of floor space.
We are well satisfied with our investment in your equipment, and would not hesitate to recommend them for like purposes.
Very truly yours
THE BUCKEYE FORGING COMPANY
Edwin T C Schwan, Treasurer.

INDUSTRIAL PLANTS, large and small, are profiting by the proven economies of the Humphrey Industrial Unit Heater.

They have found its cleanliness is in line with today's modern practices—no coal, no smoke, no dirt.

They have found that it permits a surprising saving in terms of lower overhead cost—no firemen, no boilers, no wasted fuel, no expensive floor space required.

They have found its convenience a great factor in successful plant management—the gas may be instantly turned on when heat is needed, and turned off when it is no longer required.

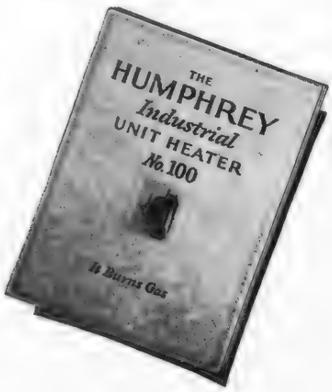
Greater production is secured on cold days because the constant, cheerful warmth of the Humphrey Industrial Unit Heater enables employees to do better work in real comfort in any part of the plant.

The letter above from the Buckeye Forging Company is only one instance of the efficiency of gas-heating with the Humphrey Industrial Unit Heater. Many others are experiencing the same results.

This complete heating system can be installed in any plant quickly and at little expense. Now is the time to prepare for cold days. Write for the Humphrey Industrial Unit Heater catalog illustrated below.

GENERAL GAS LIGHT COMPANY
KALAMAZOO, MICHIGAN
NEW YORK
29 WEST BROADWAY
SAN FRANCISCO
282-A BLUXOME STREET

Send for this Catalog NOW!



The Humphrey *Industrial Unit Heater*

NEW

THE THRUSH ELECTRIC WATER CIRCULATOR

Cures Sick Heating!

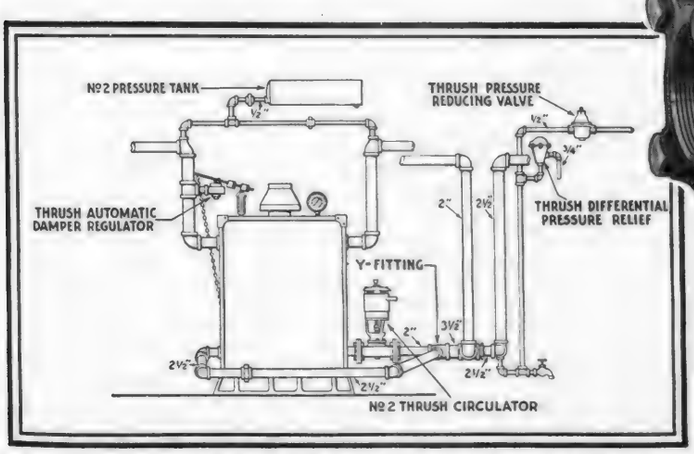
THE Thrush Electric Circulator will make sick heating plants well. *Instantly eliminates sluggish heating*, assures even temperatures at all radiators and *saves 20% to 50% of fuel consumed.*

Applied on old or new plants, it will greatly increase heating comfort and convenience. The completely Thrush equipped heating plant with Thrush Electric Circulator, Automatic Damper Regulator, Thrush Pressure Reducing Valve shown in diagram below represents the ultimate achievement in heating efficiency —the *finest and most economical form of home heating yet devised.*

H. A. THRUSH & CO.
Dept. A
Peru, Indiana

A sturdy, dependable centrifugal pump of high efficiency.

Especially designed for circulating water in a heating system.

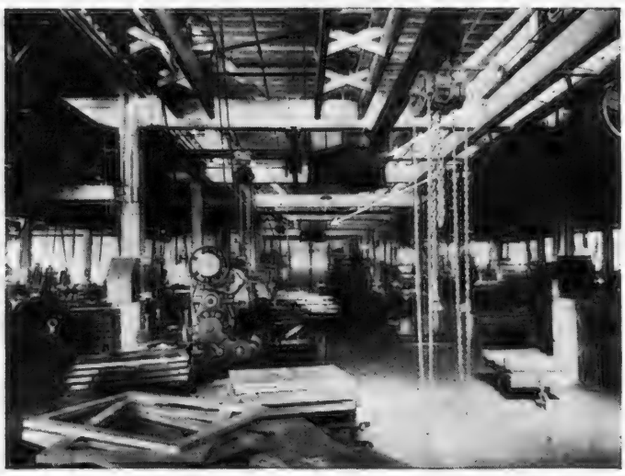


The Thrush Electric Circulator is highly recommended for oil and gas fired boilers, also for greenhouses, garages, apartments, store buildings and installations with blower unit. When designed for forced circulation, it is cheaper to install than double pipe steam and vapor jobs. Equipped with 110 or 220 A.C. 60 cycle motor for light or power line. Does not require special wiring. Very low operating cost.

THRUSH SYSTEM
OF HOT WATER HEATING

WING FEATHERWEIGHT

For All Industrial Purposes



PLANT—Every corner of this wide building is warm—and no part too warm. A single row of Wing Units does the work. No interference with cranes or shafting.

COVERAGE—Wing Featherweight Unit Heaters have the advantage of location directly over the area to be heated. They discharge warm air downward in all directions.

Their lightness permits them to be placed where they will be most effective, no matter what the roof construction.

PENETRATION—The high efficiency of the Wing Scruplex propeller-type fan used with Wing Units gives the heated discharge the volume and velocity necessary to counteract the tendency of hot air to rise and enables it to penetrate the cooler air beneath.

H C Unit with Vane Discharge for high location. Another discharge design for low positions shown above.

DIFFUSION—Various special discharge outlets are used for different types of building to deflect this discharge and spread it widely through the air to be warmed. Heat is thus diffused through every part of the building.

Wing Heater Design Heats A Plant Evenly and Economically

STOCK ROOMS—Your whole stock room kept at a temperature you want it. All your floor and wall space free of heating equipment.

ADAPTABILITY—These features not only insure even distribution of heat, they make the Wing System closely adaptable to the needs of particular buildings.

With Wing Units you require only a minimum number of heaters. Installation is inexpensive. Fuel is saved by preventing the overheating of air under the roof. All the plant is heated evenly.

Write NOW for illustrated catalog showing installation.

L C Unit. Motor and fan below permitting installation close to ceiling. 4-way discharge regularly used.

L. J. Wing Mfg. Company . 158 W. 14th St., New York, N. Y.

UNIT HEATERS

BARBER *Automatic* JET GAS BURNERS

During June, July and August, 1929, there were sold 89.7% more Barber Conversion Burners than in any corresponding quarter during the past 12 years.

No. 3-R-17-R Barber Automatic Burner

(Made in Four Sizes, as Listed Below)

A COMPLETE AUTOMATIC CONVERSION GAS BURNER LINE—FOR 90% of your inquiries at prices attractive to every home owner.

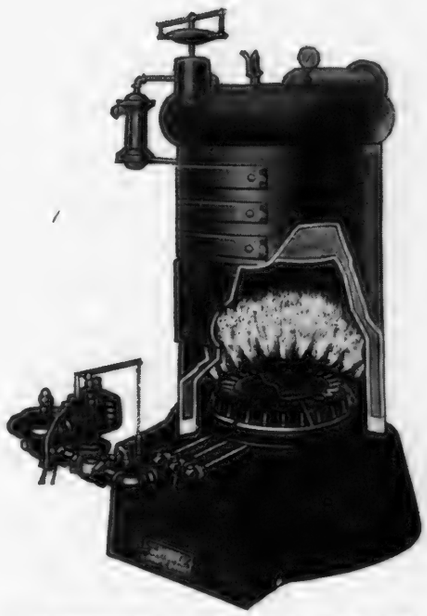
Barber Automatic Burners as illustrated above include the following items—all Completely Assembled:

Complete Burner Assembly including Upper and Lower Baffles, Manifold, and Gas Shut-off Cocks to each Burner Unit.
Bypass Assembly for Pilot Supply.
Butterfly Draft Door Assembly.
Butterfly Draft Door Lift Assembly.
No. B-2210 Minneapolis Motor Gas Valve.
Minneapolis Room Thermostat.
Gas Pressure Regulator.

Specifications and List Prices

Barber Burner Number	Grate Dia. Inches Inclusive	List Price A	List Price B	List Price C	List Price D
2-R-17-R	16 to 18	$ 84.00	$110.00	$124.00	$156.00
3-R-17-R	19 to 23	94.00	120.00	134.00	166.00
4-R-17-R	24 to 27	104.00	130.00	144.00	176.00
5-R-17-R	28 to 31	119.00	145.00	159.00	191.00

Note:—List Price A—WITHOUT Room Thermostat.
List Price B—With Minneapolis No. 4010—Plain Room Thermostat.
List Price C—With Minneapolis No. 4710—1-day Clock Room Thermostat.
List Price D—With Minneapolis No. 7710—8-day Clock Room Thermostat.
When ordering be sure to state type of Thermostat desired.



Illustrating the New (No. 3-R-17-R) Barber Automatic Conversion Burner installed in a Round Boiler—thru the clinker door opening, without removal of grate bars.

You can ***sell*** and ***install*** these modern scientific —moderately priced—Automatic Conversion Gas Burners—with very little effort—right in your own neighborhood, upon our "Specification Data Sheet" plan and reap a good harvest in ***profits*** and ***friends.***

Remember—every Barber installation sells many more. Our Engineering Department will gladly specify every inquiry if furnished with the Trade Name, Manufacturer's Name and Number of the Furnace or Boiler. Write us at once for details, ***discounts*** and sales literature.

***The* CLEVELAND GAS BURNER & APPLIANCE CO.**
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

HARDINGE dealers are satisfied

...*are you?*

With minimum turnover among Hardinge dealers, it is clear that these men are sure they have the best deal. Are you equally contented? If you think you might be making more money and handling a superior product, the chances are that you could be.

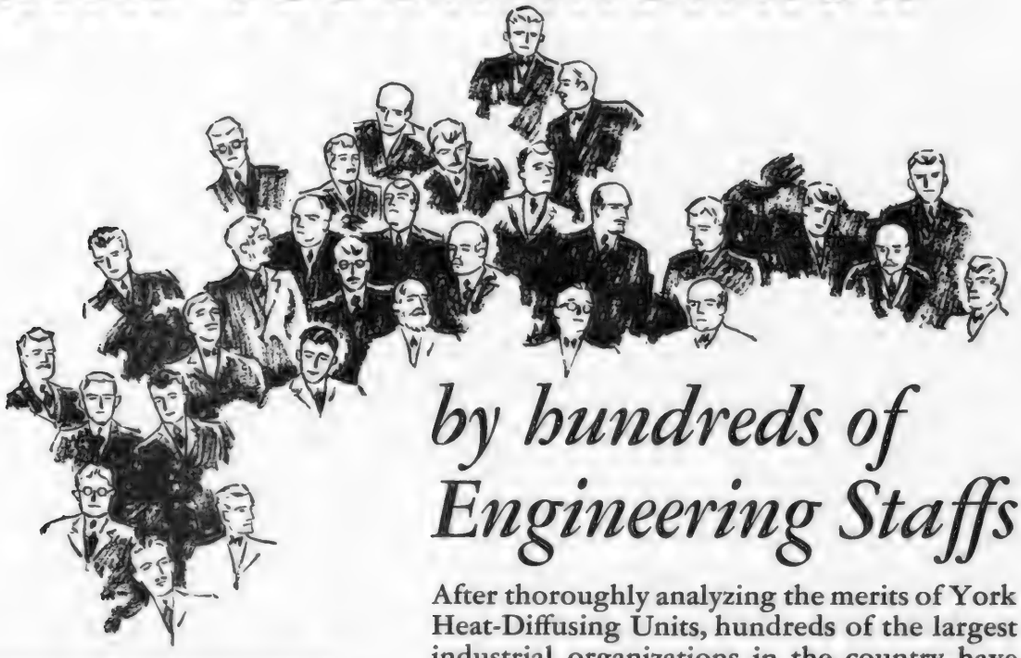
There are several fine, fat Hardinge territories open. Let's talk them over. You'll hear some surprising things; you may arrive at a decision which will prove to be the turning point in your business career, as it proved to be for the present army of satisfied Hardinge Dealers.

Let's hear from you! Call or write Hardinge Bros., Inc., at 4149 Ravenswood Avenue, Chicago, Ill.

QUIET HARDINGE

Fuel Oil Burners

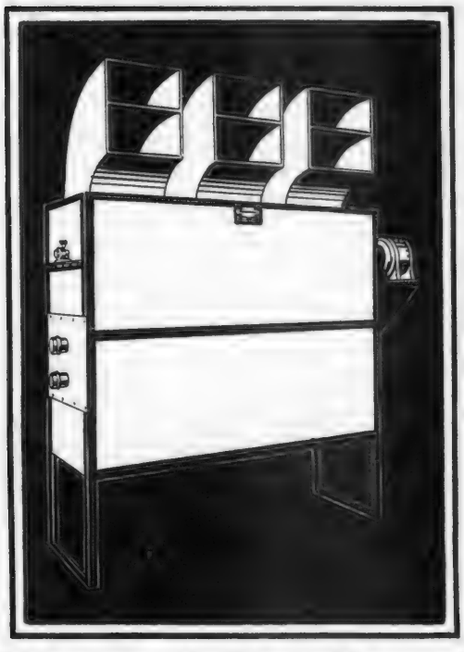
Approved and recommended



by hundreds of Engineering Staffs

After thoroughly analyzing the merits of York Heat-Diffusing Units, hundreds of the largest industrial organizations in the country have adopted York equipment as their standards.

The able engineering staffs of those powerful companies have placed their stamp of approval on York Units. They have agreed that basic operating principles were sound, that York construction was sound and York service was satisfactory. Each year has seen an enormous increase in York sales. York now annually produces Units aggregating considerably more B.T.U. capacity than any other Unit Heater manufacturer.



"Heat with Unit Heaters"

YORK HEAT-DIFFUSING UNIT

At the Basis of York Operation

1. Air is most easily moved *horizontally*, within its own temperature strata.
2. Cool air at floor level moves most easily along the floor.
3. High-velocity discharge of heated air plus floor-level intake gives maximum even distribution of heat in the working zone.
4. Multiple outlets give selective distribution and increased induction effect.

YORK Heat-Diffusing Unit

YORK HEATING & VENTILATING CORP'N

1539 SANSOM STREET, PHILADELPHIA

EUROPEAN REPRESENTATIVES: CARRIER-ROSS ENGINEERING CO., LTD., LONDON

AUTOMATIC

WHEN considering automatic controls, the largest and best concerns of the country immediately refer to Penn Automatic Switches. For the matchless performance of these better controls has won for them nationwide recognition. Their exclusive features in both design and construction, their simplicity and accuracy assure dependable and economical operation.

Moreover, manufacturers know that in this company they have found an organization of proven engineering ability to whom they may turn for intelligent, practical co-operation and advice in solving their automatic control problems.

Whether you order one Penn Switch or several thousand, you may be assured you will receive personal attention to your requirements. The complete facilities of the new Penn factory, and the accumulated experience of 13 years as automatic switch specialists are at your disposal.

Remember, there is a Penn Switch for every type of heating installation. Each is listed as Standard by Underwriters' Laboratories. Feel free to write for complete information on any type for which you may have need.

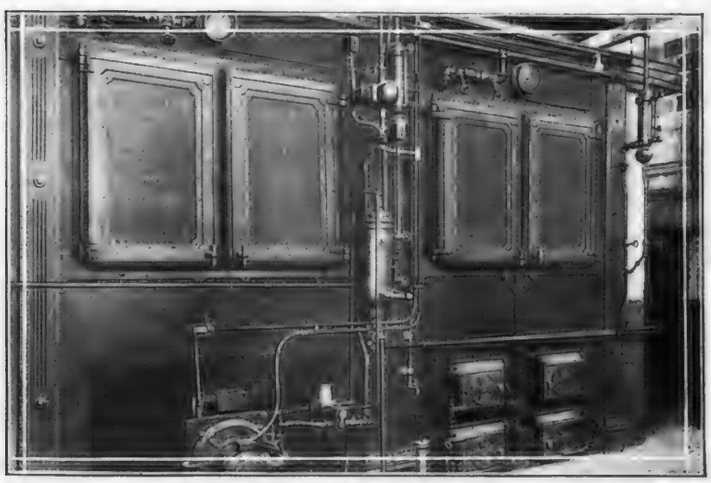
The New Modern Factory of the Penn Electric Switch Co., East Twentieth and Walnut Sts., Des Moines, Iowa

CONTROL

FOR every heating system fired by oil, whether steam, vapor, or hot water, there is a suitable Penn Safety (limit) control, and of course, the Penn Room Thermostat, the master control for room temperature. These better and safer controls eliminate the use of transformers and relays by carrying the motor circuit direct. They are enclosed in rigid cast iron frames and are provided with conduit connections for enclosed wiring. Because they do not employ mercury tubes, they may be mounted in any convenient position without affecting their operation.

Penn Type A Room Thermostat

The Penn Type A Room Thermostat controls the temperatures of their new modern factory



The boilers in the Penn factory completely equipped with Penn Controls

Here are two 150-HP boilers. One is fired with an oil burner and made completely automatic with Penn Controls. Type A Room Thermostat assures uniform temperature. Type LRP limits the steam pressure. Penn low water cut-off assures additional safety against burner operating without sufficient water in the boiler. Type LRT, cutting in and out independently maintains the boiler temperature minimum of 130 degrees, while the oil supply is controlled by a Penn float switch.

We urge responsible manufacturers to test at our expense the Penn Room Thermostat and Safety Controls for Heating Systems. Sample switches will be gladly furnished.

PENN ELECTRIC SWITCH CO.

DES MOINES, IOWA

Oil Burners, Pumps
Refrigerators
Air Compressors

A COMPLETE LINE OF AUTOMATIC ELECTRIC SWITCHES FOR
Thermostatic Switches
Float Switches

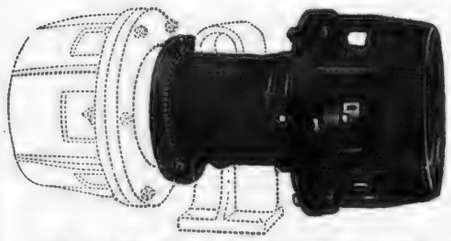
Unloader Pilots
Vacuum Switches
Pressure Switches

Specialists in District Heating

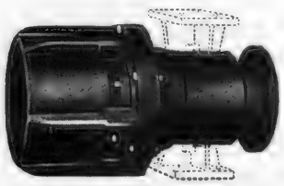
Equipment for Underground Steam Lines

There's an ADSCO Expansion Joint for Every Purpose

ADSCO Semi-Guided Expansion Joint for 4, 6, 8, 10, 12-inch traverse, 125 and 250 pounds pressure.



ADSCO Externally-guided Expansion Joints for 4, 6, 8, 10, 12-inch traverse, and 125 and 250 pounds pressure.



ADSCO Duplex Sleeve-guided Expansion Joint for pressures up to 500 pounds and temperatures to 750 degrees Fahrenheit.

ADSCO Multiple Diaphragm Variator for pressures to 250 lbs. and temperatures to 400° Fahrenheit.

ADSCO Slip-Type Expansion Joints are made for 125 and 250 pounds pressure, single and double slip, semi-guided and fully guided, with and without tie rods, service outlets, anchorage; 4, 6, 8, 10, 12 inch traverse. For pipe lines conveying steam, water, oil, air, and other fluids.

For high pressure and superheated steam, the ADSCO Duplex-Sleeve Guided Expansion Joint is designed with air-cooled slip that prolongs the life of the packing.

For risers, ADSCO Riser Joints, internally guided, allow expansion up to 8″, keep sediment away from packing, remain in true alignment.

ADSCO Variators—Packingless Expansion Joints are now built for both high and low pressures—the Model O Single and Double for 50 pounds pressure and 1⅜ and 2¾″ traverse respectively, the Model P Double Variator for 125 pounds pressure and 2″ traverse—the Multiple Diaphragm Variator for pressures up to 400 pounds and temperatures up to 750° Fahrenheit. Traverse up to 4½″.

Mail the coupon for book describing complete line of ADSCO Expansion Joints.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

50 Years in Business

to be sure of getting

ADSCO

EXPANSION JOINTS

Order Direct

The First Step is to get this BOOK

AMERICAN DISTRICT STEAM COMPANY
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Please send me free your new book, "Reference Data on Expansion in Pipe Lines."

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Position .....

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Every sale of a hiJet

is a sale of *fine heating service*

For the economical distribution of heat in

Factories
Railroad Shops
Roundhouses
Warehouses
Mills
Garages
Gymnasiums

and all industrial buildings, as well as in special process rooms where uniform heat maintenance is required.

Not equipment but trouble-free, economical heating service—that's what your customer really pays for. And that's what Herman Nelson hiJet Heaters will give him—to a far-from-ordinary degree.

The hiJet's heating element is the Herman Nelson Radiator which has no brazed, welded, soldered or expanded joints to fail or leak in service. Withstands steam pressures up to 150 pounds.

A specially designed motor, the Her-Nel-Co, permits simple speed control with minimum running current. In operation the hiJet directs a high velocity vertical jet of warm air downward, dispelling the cold air strata at the floor line. The results of its installation are constant, thorough heat distribution, flexibility, freedom from trouble and repair.

The hiJet is made in three sizes—all easy to install. Before selecting a heater for your next job, mail the coupon for the hiJet catalogue.

This radiator makes the difference

Richman Brothers Bldg., Cleveland, Ohio
Christian, Schwarzenburg & Gaede—Architects and Engineers, Cleveland, Ohio

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*
Builders of Successful Heating and Ventilating Equipment Exclusively

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The HERMAN NELSON hiJet TRADE MARK HEATER

GET FREE BOOK

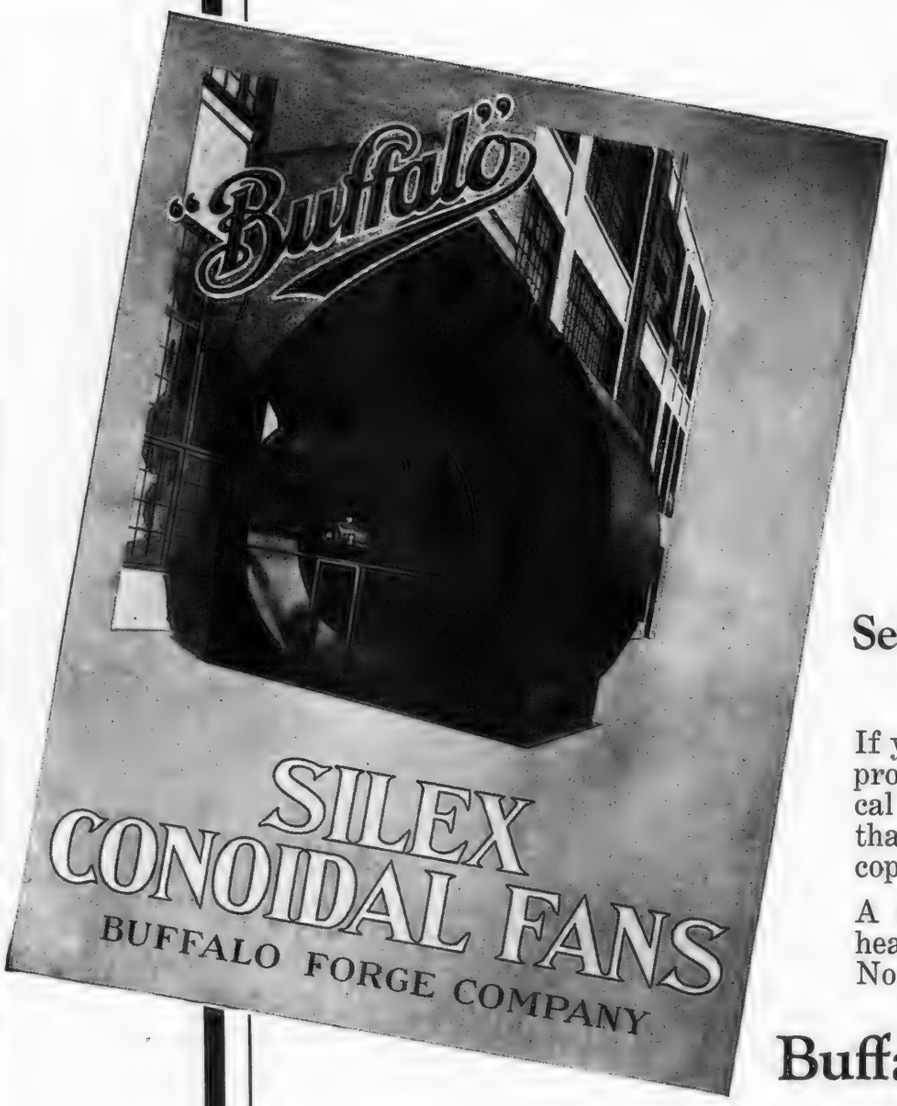
THE HERMAN NELSON CORPORATION
Moline, Illinois

Gentlemen:
Please send me book No. 12 containing the facts about Herman Nelson hiJet Heater.

Name..... *Firm Name*.....

Address..... *Type of Building*.....

It's ready!



An attractive illustrated book, dealing with our new Silex Conoidal Ventilating Fan, has just been completed and is now ready for distribution.

This interesting 32-page catalog is full of valuable information and data and should be very useful to the architect and engineer.

Send for your copy today

If you are interested in improved, quiet and economical ventilation, we suggest that you write for your copy immediately.

A request on your letterhead will bring this catalog, No. 424, by return mail.

Buffalo Forge Co.
480 Broadway
BUFFALO, NEW YORK

IN CANADA
Canadian Blower & Forge Co., Ltd.
Kitchener, Ont.

"Buffalo"

The New Modern Ventilating Fan—

Silex Conoidal Fans

Where McALEAR Solves your Pressure & Level Control Problems

General Office

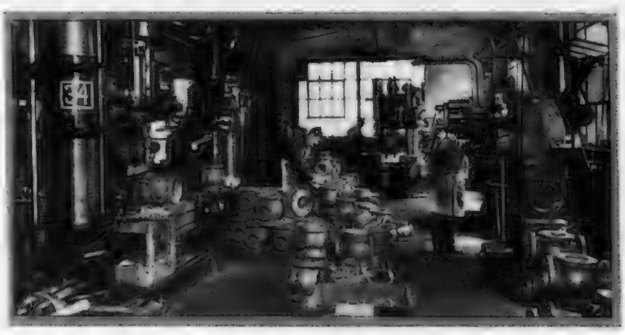
The Organization Behind The Product

This looks like a real, aggressive, efficient organization, doesn't it—like mighty good products could be turned out by that modern machinery and those reliable workmen. Can't you picture your orders coming into that business-like office and getting immediate attention?

This is the organization behind McAlear Products—that proves McAlear Quality is NOT "paper" quality but is really translated into sensitive, accurate, efficient Pressure and Level Control Equipment.

All through the complete line—casinghead regulators, back-pressure valves, liquid level controls, water feeders, gasoline traps—the same sincere quality gives you dependable service obtainable ONLY from McAlear Products.

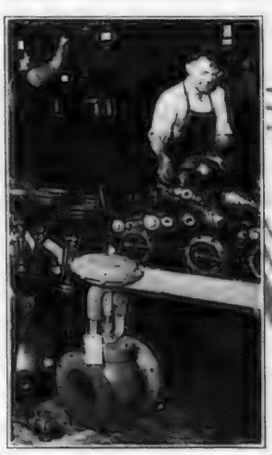
For *all* your pressure and level control equipment, see McAlear. Send for our 128-page text book. WRITE FOR IT TODAY.



Another general view of our plan showing the production of McAlear Products

A section of our plant showing assembling and testing of all McAlear Specialties before shipment.

A section of our stock room where a large assortment of stock is carried to meet all demands.



Section of our Testing Department

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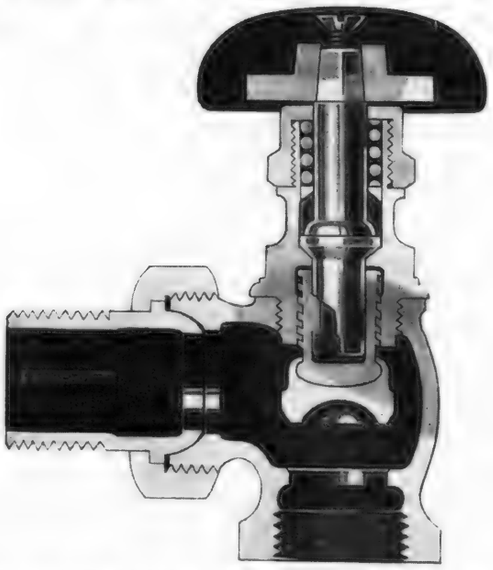
THE McALEAR MFG. CO.

190 S. Western Ave. Chicago, Ill.

Sales Engineers in all Principal Cities

McALEAR

Marsh Re-enforced PACKLESS WATER Radiator Valves



Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced GRADUATED WATER Radiator Valves

Fig. 139

Oval Wheel,
Lever Handle
or
Lock Shield

Fig. 239

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have tens of thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

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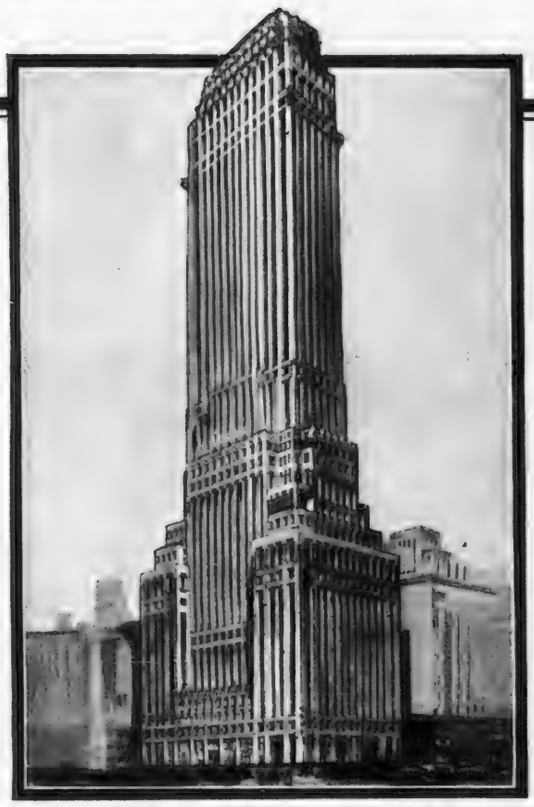


Chanin Building, New York. *Architects:* Sloan and Robertson. *Consulting Engineers:* Clark, McMullen and Riley.

Why Unit Ventilators are in the Chanin Building

"Fifty-six stories of sunlight" is the slogan of the Chanin Building. It has windows, and air on all sides... but Unit Heater-Ventilators are in executive offices and board-rooms as high up as the forty-fifth floor! They are also used for special service in the lobby and sub-basements.

The reason Sturtevant Unit Heater-Ventilators are in these sun-lit offices is because they provide *controlled* ventilation . . . *draft-free,* outdoor air, filtered clean...*precise* temperatures...*assured air-comfort* at any season—in any weather!

Unit Heater-Ventilators are used in the lobby as recirculating heaters and provide approximately ten times the amount of heat that direct radiators could furnish.

Sturtevant Unit Heater-Ventilators require no duct work . . . They are compact, handsome in appearance and SILENT!

Sturtevant Unit Heater-Ventilators provide the architect, engineer and contractor with a flexible, individually controlled system of heating and ventilation admirably adaptable to the executive type of offices. They also provide a logical means of heating and ventilating Schools, Clubs, Churches, Public Buildings, Show-Rooms, Shops and Residences. Pictures of many of these installations are shown in a new Data-Catalog just issued. It will be helpful and suggestive to you—and it will be a pleasure to mail you a copy of this 40 page book on request—no obligation.

B. F. STURTEVANT CO.

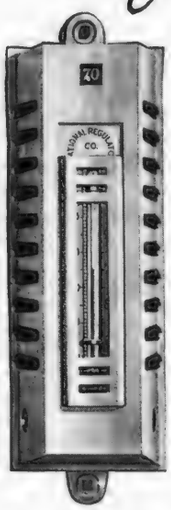
Plants and Offices: Berkeley, Cal., Camden, N. J., Framingham, Mass., Galt, Ontario, Hyde Park, Mass., Sturtevant Wis. *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg, *also Branches in Principal Cities and Agents in Foreign Countries.*

Sturtevant

REG. U.S. PAT. OFF.

The Silent Unit Heater-Ventilator

NATIONAL CONTROL of Temperature and Humidity



FOR a quarter of a century, and longer, this organization has worked for the betterment of heating and air conditioning control apparatus.

The results of this work are a record of development:

The development of National Thermostats for any form of temperature control.

The development of National Humidity Controllers for maintaining constant relative humidity in blast heating and air conditioning.

The development of National Metaphrams for valves, damper motors and damper regulators.

The development of auxiliary operating equipment for the continuous functioning of this apparatus with a minimum of maintenance trouble.

Possibly we could have been content to "ride along" on the basis of our first discoveries, because many of the National Systems installed over twenty years ago are still functioning with an accuracy and dependability that is working proof of the correctness of their design and installation.

But—the installations of National Systems being made today are the culmination of all this experience, all this development, and all this study of heating, ventilating and air conditioning control requirements.

The untiring efforts that have brought about the perfection of National equipment have also brought to us an ever increasing number of installations that are the peer of their kind, and an ever increasing number of architects and engineers, nationally and internationally known for the excellence of their work, who rate National apparatus as their standard of efficiency.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

National control equipment for heating and air conditioning is described in five different pieces of literature:

- National Heat Regulation (a pictorial synopsis of National installations).
- National Heat Regulation, Mechanically described (a loose leaf booklet of National Thermostats, Humidity Controllers and auxiliary equipment).
- A-Jacks Steam Damper Regulator (for high pressure boilers).
- Bulletin LP-100—Metaphram Damper Regulators (for low pressure heating boilers).
- Bulletin F-100 — Metaphram Type "F" Damper Regulators (for hot water boilers and domestic water heaters).

Any of this literature will be mailed to you, if you are interested. Just check the coupon and pin it to your letterhead.

Or, if you have a specific problem of temperature or air conditioning control to be solved, the services of this organization are at your disposal without obligation.

NATIONAL REGULATOR CO., 2309 Knox Ave., Chicago

Send us the following literature:

- ☐ National Heat Regulation.
- ☐ National Heat Regulation, Mechanically described.
- ☐ A-Jacks Steam Damper Regulator.
- ☐ Bulletin LP-100.
- ☐ Bulletin F-100.

Address attention of.....

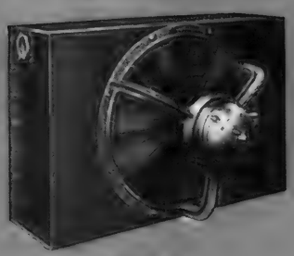
(Please enclose with your letterhead)

NATIONAL REGULATOR CO. CHICAGO

MASSACHUSETTS Unit Heaters

Type "V"
For Floor Mounting

Type "H"
With Recirculating Box
For Floor Mounting



Type "H"
For Ceiling Suspension

A Size and Type for Every Requirement

Massachusetts Unit Heaters are manufactured in three distinct types and numerous sizes to meet every requirement for efficient and economical heating and ventilating of large areas such as manufacturing plants, factory offices, garages, etc., and in addition, applications are found in the industrial drying field.

Massachusetts Unit Heaters are being very largely used in new factory construction, and owing to their ease of installation and lower expense are also ideally adapted for older buildings where changes and revamping operations are being made.

Massachusetts Unit Heaters are manufactured complete in our large factories in Cleveland. We build both ceiling and floor types, utilizing either steam or hot water. Our engineers will be glad to offer suggestions recommending the type best adapted to your requirements.

Type "C" for Ceiling Suspension

The BISHOP & BABCOCK SALES COMPANY, Cleveland, O.

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BISHOP & BABCOCK

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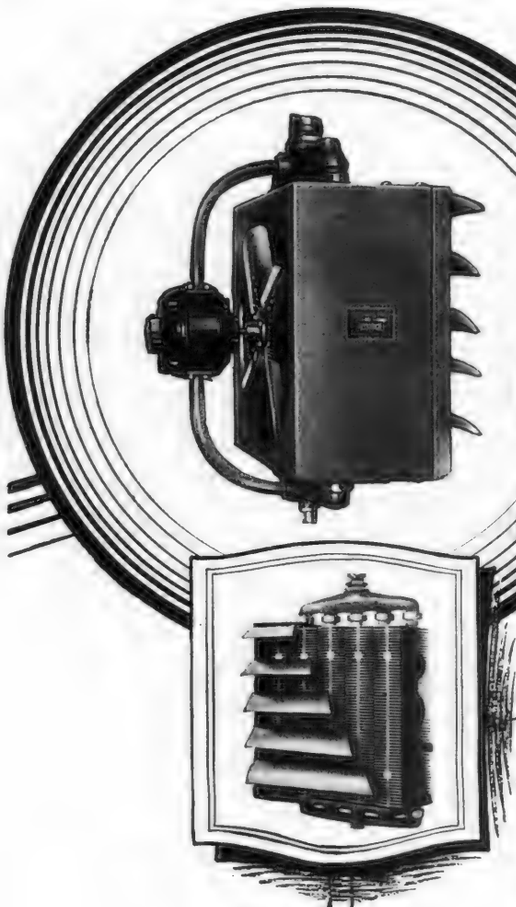
HEATING SPECIALTIES VENTILATING EQUIPMENT



Specify permanence—

WHEN you specify Thermal Units you specify *permanent* heating efficiency. This, because the vulnerable point of ordinary unit heaters has been made strongest point of the Thermal Unit.

Consider the *security* of installing a unit heater in which the heating section is tested to 400 pounds pressure—a unit heater in which the heating section has no joints, welds or soldered connections—a heater with a heating section that is immune to corrosion.

In laboratory tests the Thermal Unit is surpassed by no other unit heater. But never forget that the laboratory tells only part of the story. It is in the greater laboratory of actual application that the durability of the Thermal Unit means *maintained* efficiency—efficiency that can be translated into fuel and dollars saved.

Let us show you how, why and where the Thermal Unit "outlasts them all."

THERMAL UNITS CO.
A Subsidiary of the Mechanical Mfg. Co.
Pershing Road & Loomis Sts., Chicago
Eastern Office, 30 Church St., New York, N. Y.

THERMAL UNIT
INTEGRAL SECTION
HEATERS
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APPROVED BY INVESTIGATING COMMITTEES
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At Philadelphia—

A New Declaration of Independence

FREEDOM will ring out anew at Philadelphia—freedom in workshop and home; in mine, mill, factory and office—freedom from the tyranny of heat and cold, wind and weather.

The new Declaration of Independence will be embodied in the exhibits at the International Heating and Ventilating Exposition at the Commercial Museum, Philadelphia, January 27 to 31, 1930.

In conjunction with the annual meeting of the American Society of Heating and Ventilating Engineers, this exposition will display the latest and greatest achievements in heating, ventilation, air-conditioning methods, machinery, materials, equipment and control instruments—you can see them here, study them at your leisure, compare, discuss them and your needs with specialists in attendance to help you.

It will be an event of outstanding importance—an educational opportunity which every alert engineer, business executive and public official should grasp. Many thousands will do so. Give yourself the same advantage. Be there. Devote a week to it. Make a note of the date now.

International Heating & Ventilating Exposition

Under Auspices American Society Heating & Ventilating Engineers

International HEATING & VENTILATING EXPOSITION Commercial Museum PHILADELPHIA

Commercial Museum, Philadelphia, January 27 to 31, 1930

3714

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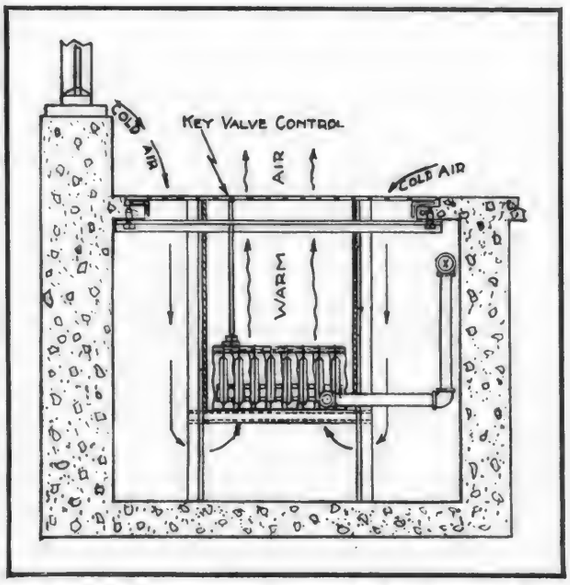
Why Use ROBRAS 20-20 Radiators

Out of Sight — Out of the Way in Showrooms?

It is impossible to get the most from a show window if it is even partially blocked with an old fashioned hard-to-keep-clean, cast iron radiator. Yet, because glass is such a splendid conductor of cold from outside, radiators must be under the windows.

Robras 20–20 Radiators installed as illustrated here answer the problem. Robras 20–20s are suspended below a floor grille. Sheet metal partitions below this grille provide three ducts. One, in the center, provides an outlet for the heated air. The two in front and in back of this duct provide for a return for the cooled air.



Method of installing Robras 20–20 Radiators below floor level

It is the exceeding simplicity of such an installation that makes it so profitable to the heating contractor. The light weight and small size of Robras 20–20 Radiators make necessary neither expensive supports nor large and elaborate casings. The radiators can be suspended from the heating pipes. The casing is simple, as shown in the drawing.

To find out how great the profit is in installing these Robras 20-20s, send us your name.

We will send you complete information, including data sheets and price lists.

ROME BRASS RADIATOR
CORPORATION
ONE EAST FORTY-SECOND STREET ❦ NEW YORK CITY

Watch the up-swing follow sales of

Mueller Automatic Heat Controls

In every house—old or new—where there's a hot water expansion tank, there is profit waiting that will help to swing up that sales curve of yours. Right in your vicinity, every owner of a hot water heating plant equipped with an expansion tank is a live prospect for a Mueller Automatic System of Hot Water Heat Control.

You don't have to be a "fast talker" to sell Mueller Automatic Heat Control Systems to these home owners. There are nearly a dozen advantages to this Mueller System—really worth-while advantages that speak in terms of fuel saving, safety and convenience — language that home owners can understand and appreciate. Installations can be made quickly and easily, and results make a booster of every man you sell. The cost is moderate and there's a substantial margin of profit for you.

We'd like to tell you all about the Mueller Automatic Heat Control System, because we know that you will see the profit possibilities as others have. Your request will bring complete details.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches*: New York, Dallas, San Francisco, Los Angeles; *Canadian Factory*: MUELLER, Limited, Sarnia.

MUELLER

AUTOMATIC HEAT CONTROL SYSTEM

IN OIL BURNERS . . .
Back of Good Design—Good Construction

GOOD design assures fulfilment of purpose. But good design alone will not guarantee lasting, efficient service.

An oil burner can be no better than its constituent parts. If feed lines corrode, if nozzles and strainers become clogged with rust, if suction lines leak and joints loosen . . . *goodbye to good service.*

Copper, Brass and Bronze parts assure greatest efficiency and longest service. Copper, Brass and Bronze are rustproof and are highly resistant to corrosion in oil burner service. Brass pipe or Copper tubing is best for fuel and return lines; for suction, gravity, and pressure lines. Brass valves are tight and give lasting satisfactory service. Copper, Brass or Bronze screens are most durable and efficient wherever corrosion is met.

The uses of Copper, Brass and Bronze for better oil burner installations are described in a new book which we will be glad to forward, without cost, upon request. Or you may freely consult our Technical Department about the uses and proper application of these rustproof metals.

COPPER & BRASS
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25 Broadway, New York

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COPPER, BRASS, BRONZE—THE WORLD'S MOST USEFUL METALS

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Dallas Heating & Ventilating Company
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Ventilating Contractor

American Blower Corporation
Fan System Apparatus

AEROFIN the original standardized, non-corrosive light-weight Fan System Heat-Surface is made in four Types and 202 sizes, designed by Fan Engineers to meet specifically every present and future requirement of the Architect, the Engineer, or the Contractor. An unusually comprehensive Bulletin containing 128 pages, with 23 Piping Diagrams in 4 colors, and complete

Technical Data may be had gratis upon request on your business letterhead. Ask Newark for Bulletin V-119

AEROFIN is sold only by Manufacturers of Nationally Advertised Fan Heating Apparatus.

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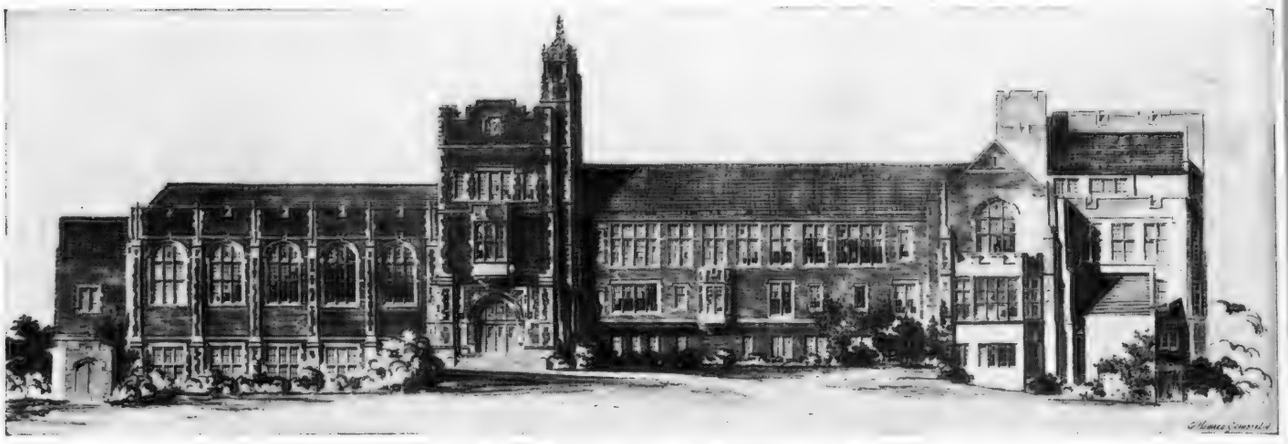

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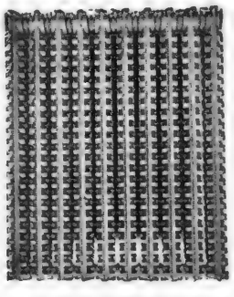

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The Building Industry Is Going Ahead

Although the Stock Market Goes Down

Without exception replies to telegrams sent to leaders of the building and related industries state that the recent break in the stock market will not retard but will benefit the building industry.

National Building Publications, actuated by its obligations to the industry, telegraphed on Wednesday, October 30th, for expressions from leaders in the building field. We believed such statements would have a stabilizing effect on the situation.

Over 200 replies were received by National Building Publications. All indicate that the drop in stocks will reduce unwarranted speculation and divert such investments to the construction of new buildings and the improvement of existing structures.

Those replies received before this issue went to press are reproduced in the accompanying supplement.

Truly, the building industry is going ahead with renewed confidence.

Modern business paper publishing practice involves fast, authoritative information in emergencies. This special news bulletin again indicates the determination and ability of the editorial staff of HEATING AND VENTILATING to serve its industry to the utmost under all circumstances.

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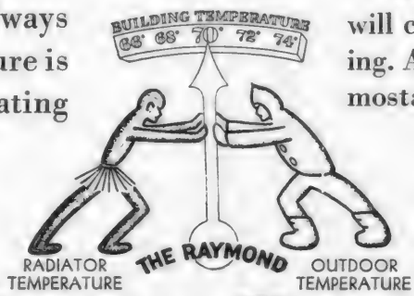
A Raymond DUO-STAT always knows what outdoor temperature is doing and regulates the heating plant **to produce the exact radiator temperature needed.**



DUO-STAT

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Its Advantages

Can be threaded and cut easily and quickly.

Makes up with screwed fittings of same material.

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C. N. I. PIPE AVAILABLE IN
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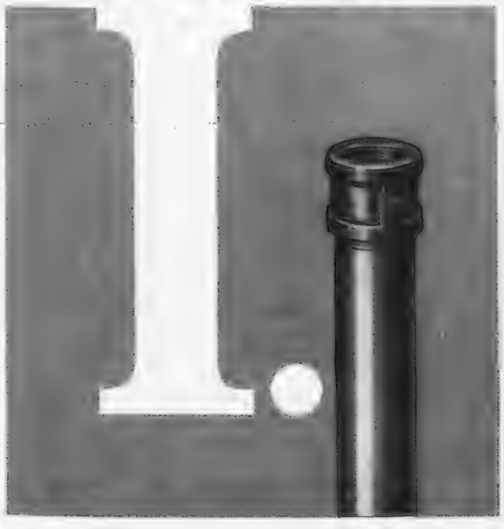

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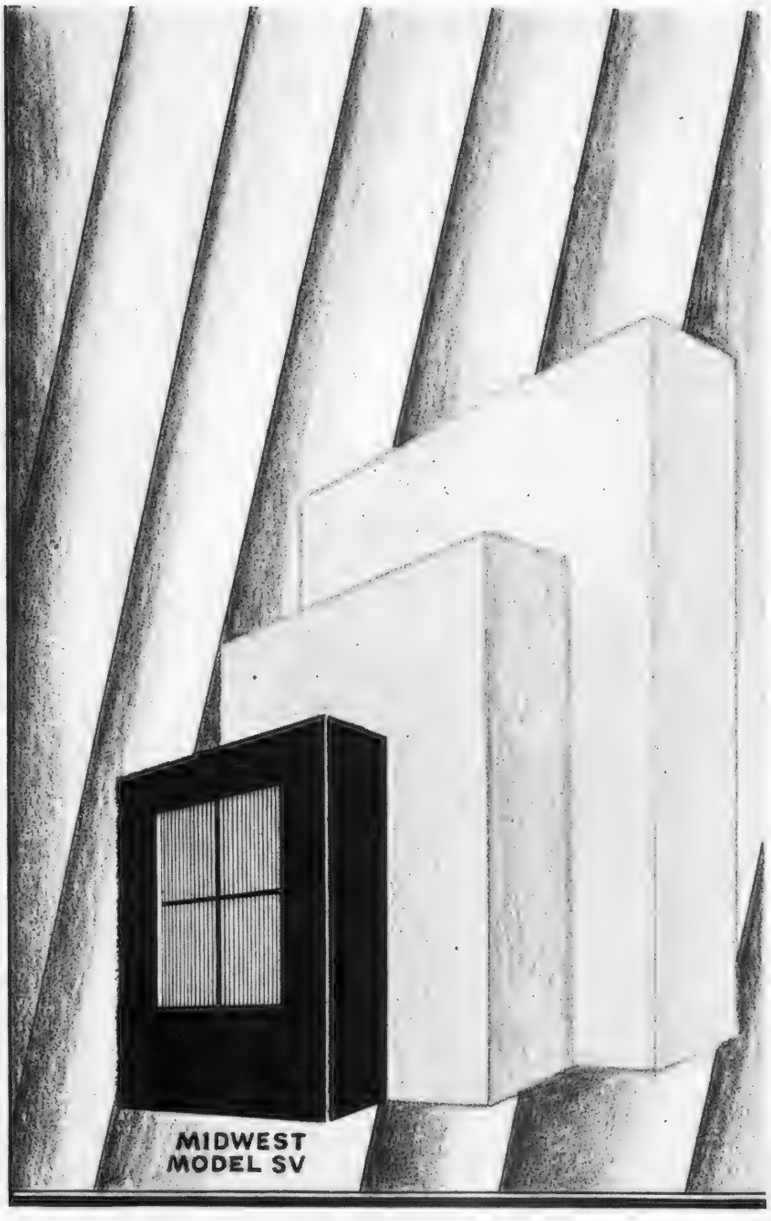

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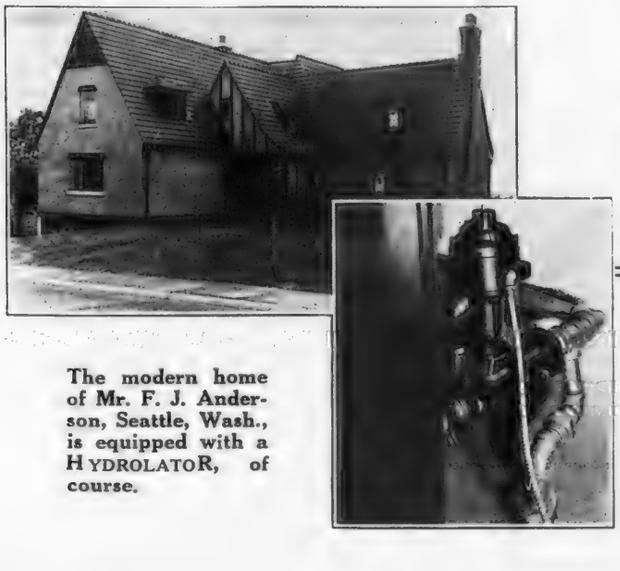

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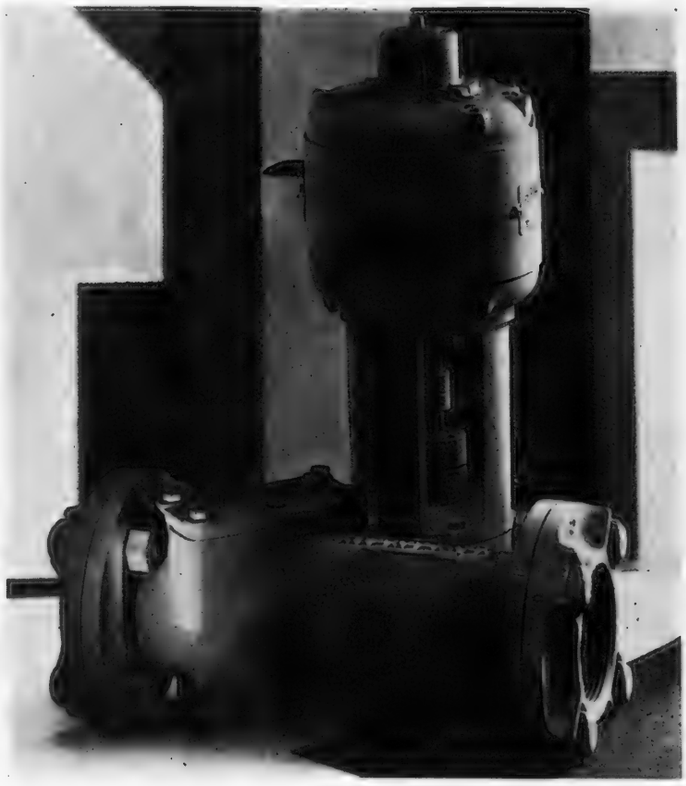

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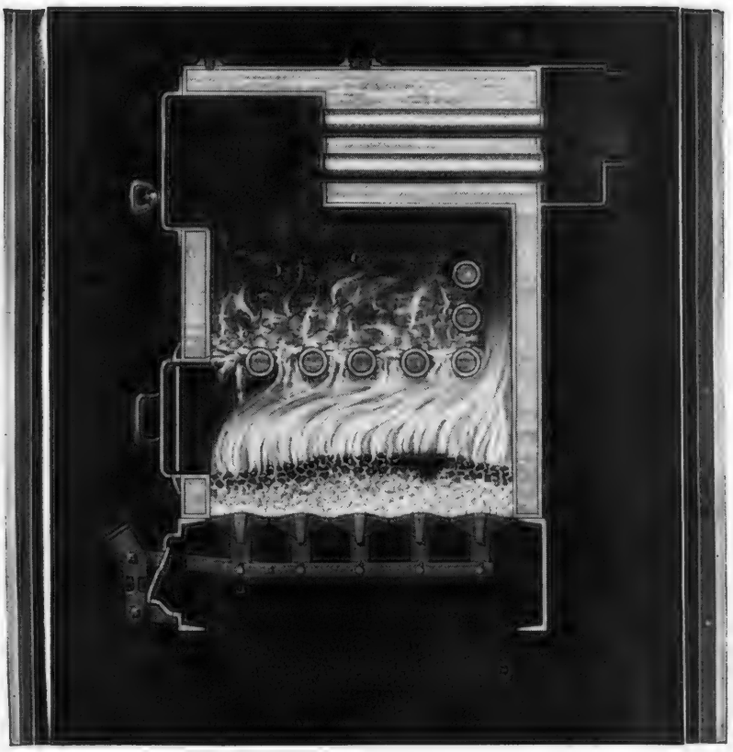

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Hot water costs drop when the Heggie-Simplex Water Heating Refuse Burner is installed. C. L. Anderson, prominent Chicago builder, says "Your burner saved 60% of the fuel as compared to the heater which it replaced."

The advanced heating-boiler style of design of the Heggie-Simplex Refuse Burner assures complete combustion of both fuel and trash and maximum utilization of usable heat units. Through a passage at the rear, the flames rise up and over the drying, burning refuse to an auxiliary chamber at the top where they thoroughly ignite all gases while still in the fire box.

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WATER HEATING REFUSE BURNERS

HEATING AND VENTILATING

formerly

The Heating and Ventilating Magazine

Contents of previous issues of HEATING AND VENTILATING *can be found by consulting the Industrial Arts Index at the nearest library.*

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VOL. 26 **NO. 11**

Trends

Heating men used to be few and far between at gas and oil-burner conventions. It is not so now, and there is a reason. At the American Oil Burner Association convention this year in New York, there were as many as 57 exhibits of house-heating equipment, while at the American Gas Association convention last month in Atlantic City, no less than 48 gas house-heating products were on display, representing 18% of all the gas exhibits. The figures are even more significant when it is considered that in each case they represent an increase of more than 8% over last year.

A. S. Armagnac

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THIS 23-story building, designed especially to meet the peculiarly exacting requirements of the textile industry, is equipped throughout with Sarco Radiator Traps.

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They are unusually long lived because the metal in the expansion element is stressed less than in ordinary constructions.

The wide open movement of the valve provides free discharge at all times. No steam or vapor can enter the return. Maximum closing pressure and perfect setting insure a positively tight valve. Sarco Traps will not bind, water hammer or freeze.

Other advantages are explained in Booklet P - 110. Send for a copy.

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A Good Heating System

HEATING AND VENTILATING

Editorial

ANNOUNCEMENT by the steel boiler manufacturers of a steel heating boiler rating code will be taken as removing the last obstacle to a solution of the boiler rating question. When the revised A.S.H.V.E. Boiler Rating Code was up for adoption last summer, it will be remembered, agreement was forthcoming from all of the interested parties with the exception of the steel boiler people. It looked for a time as if this lack of unanimous support might cause a hitch in the proceedings. However, the code now put out by the steel boiler manufacturers has the tacit approval of the A.S.H.V.E. and is acceptable to the society on the ground that it supplements, rather than supplants to any extent, the A.S.H.V.E. code.

There is every reason to look forward to the adoption of the A.S.H.V.E. code at the society's next annual meeting in January. This action, coupled with those already taken by the cast-iron boiler and steel boiler manufacturers, should have the effect of unifying all the interests concerned in the present boiler rating movement.

WHEN such a representative group of heating men can be brought together as that which met in New York recently, at the call of the Heating and Piping Contractors New York City Association, to discuss the serious situation confronting the industry, it is a sure sign that something is radically wrong. As William E. Taylor, executive secretary of the association expressed it, "the building construction industry, as a whole, is down in a pit. It cannot go deeper, for there lies bankruptcy. It cannot get out, because there is no ladder by which it can drag itself completely to the top. It is down in that economic pit because of the rotten credit conditions that have been allowed to grow up about it in recent years, to the point of almost complete destruction of the meaning of the word 'credit'.

"During recent years, there has been great production at manufacturing centers. It has resulted in even greater pressure being applied to distributors to find a market for the material produced, resulting, in turn, in the encouragement of great numbers of buyers to take the product of the mills whether or not they had money with which to pay for it, trusting to luck, diversion of borrowed funds and other devices to avoid the inevitable day of reckoning.

"This has raised up, not only in this city, but in all parts of the country, a great many irresponsible heating and piping contractors. In New York alone there are today 2500 such contractors, most of whom, every business day of the year, are placing orders for the delivery of heating and piping material which they cannot see their way clear to pay for because their inexperience and irresponsibility cause them to bid on and accept installation jobs that cannot possibly be completed for the amounts named in their contracts."

With credit control as the key to the situation, a movement was inaugurated by the meeting to organize a "Heating Board of Trade," to comprise all branches of the industry, including manufacturers, jobbers, engineers and contractors, with a view to furnishing a common point of contact and thus constituting the organization as the voice of the industry in its locality.

It is no secret that the plan in its present form is only a feeler and is preliminary to a movement to establish a National Heating Board of Trade.

IT is no mere coincidence that almost simultaneous anouncements have been made of the formation of the Boiler and Radiator Manufacturers Institute, the Steel Heating Boiler Institute, the Warm Air Furnace Institute and the National Plumbing and Heating Institute. For some time the heating industry, like so many others, has been troubled with unfair trade practices and unfair methods of competition. Manufacturers, jobbers and contractors cannot agree among themselves to fix prices, but they can submit their troubles to an umpire and have him decide what is fair and what should be "cut out." Such an umpire and business champion is the Federal Trade Commission in Washington, acting through its Division of Trade Practice Conference.

In its contact with the heating industry, the division's activities have been directed particularly toward aiding the different industries to adopt rules of business conduct, looking to the elimination of harmful and unfair trade practices. The fact that all the representative branches of the heating industry have responded to the suggestion of the Division of Trade Practice Conference is one of the most encouraging signs to be found that the industry is prepared to make a serious effort to put its house in order. At the same time, there is significance in the quiet but effective methods the Federal Trade Commission is using to bridge the gap between ruinous competition and "agreements in restraint of trade."

Space Cooling with Ice

by **C. D. ROBISON**

Operating Engineer,

Metropolitan Utilities District, Omaha, Neb.

Building in Omaha Cooled with Ice

APPROXIMATELY one-third of the ice manufactured in Omaha, Neb., is produced by the Ice Department of the Metropolitan Utilities District, which operates the water, gas and ice plants now owned by the city. There is an excess of ice-making capacity in Omaha and for the past three summers the city's ice plant has not operated during June, July, August and part of September, the requirements for ice during this period being supplied from permanent storage.

In considering possible ways in which the excess ice-making capacity could be utilized it was thought that space cooling with ice might be attempted. This, if practical, would be valuable for cooling offices, barber shops, restaurants, drug stores and residences, all of which are too small to justify the adoption of the expensive air-conditioning equipment which already is available.

Early last spring the Metropolitan Utilities District opened a new branch office in Omaha in which a forced circulation warm-air heating system was installed, and this offered an excellent opportunity to experiment in the cost of space cooling with ice. Cold-air returns, warm-air leaders and fans were installed as part of the heating system, so all that was required for the experiment in cooling was to connect an ice box or cooler of sufficient size to the cold-air return of the heating system ahead of the circulating fan, which is part of the heating unit.

In commenting on this article, the first published account of the experiments on space cooling with ice in Omaha, C. George Segeler, technical editor of the American Gas Association, stated that:

"While Mr. Robison's method of house cooling necessarily is of limited applicability, this interesting article presents valuable quantitative operating data on space cooling of small buildings. The utilization of the off-peak power for ice manufacture should make this attractive."

The south side office is one of the six similar business places situated in a one-story structure, there being two such stores on the north and three on the south of the one occupied by the district. Outside walls of the building are of concrete blocks, with brick facing, having a total thickness of 8 in. Cement blocks 8 in. thick form the basement walls, while the partition walls are of similar blocks 4 in. thick. In the construction of the roof tar felt and gravel is laid on tongue and grooved planks 2½ in. thick. The office ceiling is of lath and plaster, there being an air space between the ceiling and the roof approximately 3 ft. high in the front and 1 ft. high at the rear. A store front window occupies the entire west end of the office which is 75 ft. long by 17 ft. 6 in. wide by 11 ft. 4 in. from floor to ceiling. The basement has a height of 8 ft. 6 in. measured to the underside of the office floor. There is an open stairway leading from the office to the basement.

Using the standard heat loss constants, the estimated average hourly loss, with an inside temperature of 700° F., for 10 hrs. and 50° F. for 14 hrs. and an outside temperature of 10° F. below zero was 90,000 B.T.U., or 1323 B.T.U. per hr. per degree difference in temperature.

In .winter, with the stores on either side heated, there is no loss of heat through the party walls, but in summer, with the office cooled, heat will be transmitted through these walls. It was calculated that this loss would amount to 500 B.T.U. per hr. per degree difference, giving a total heat absorption of 1823 B.T.U. per hr. or 43,700 B.T.U. per 24 hrs. per degree difference in temperature between inside and outside.

To maintain a difference of 10° between inside and outside the absorption of 437,000 B.T.U. would be required per 24 hrs. Assuming that ice in melting absorbs 143.6 B.T.U. per lb., approximately 3000 lbs. of ice per 24 hrs., or an average of 125 lbs. per hr., would be required to maintain an inside temperature 10° below that existing outside.

To check the reasonableness of these estimates another set of calculations was made to determine the probable maximum use of ice, using the constants and temperature differences shown in the following table.

Heat Infiltration Constants

	Inside Temperature Deg. F.	Outside Temperature Deg. F.	Constant B.T.U. per sq. ft.
Roof	80	120	0.20
Glass front	80	116	1.10
East walls	80	110	0.25
Party walls	80	95	0.25

Assuming one air change per hour throughout the building, with 20° difference between inside and outside temperatures, use 0.355 B.T.U. per cu. ft.

These calculations indicated that a total of 40,000 B.T.U. per hr. must be absorbed under the conditions outlined above to maintain a difference of 20° between inside and outside under the worst conditions that probably would exist in Omaha. Assuming that ice in melting absorbs 143.6 B.T.U. per lb., approximately 280 lbs. of ice would be required during the maximum hour or worst condition that was anticipated.

Gas-Fired Furnace Unit Used in Connection with Cooling System in Omaha Office Building

This figure of 280 lbs. per hr. compares with the figure of 125 lbs. per hr. for maintaining a 10° difference in temperature, as indicated in a previous paragraph.

Space in which the cooler, or ice container, was to be placed was limited. Therefore, it was decided to build the cooler to hold five 400-lb. cakes, with a central section to hold about 500 lbs. of ice in small pieces. These would be the residue of the whole cakes left over when they had melted to such a degree that new cakes should be placed in the sections. This gave the cooler a total capacity of 2500 lbs. when full of ice. It was thought, if this size proved insufficient, that on extremely hot days the cooler could be filled twiqe, if necessary.

The circulating fan, which is a part of the warm-air furnace unit, has a capacity of 750 cu. ft. of air per minute. This provides for all of the air in the office, exclusive of the basement, passing through the cooler during each 20-min. period.

A recording thermometer, showing both inside and outside temperatures, was installed at the beginning of the test. During July the difference between mean inside and mean outside temperatures between the hours of 8 A. M. and 5 P. M. was 6.6° F. During the last ten days of the month the difference averaged 10.7° F. during these hours. The ice consumption for the month was 33 tons.

A study of the data accumulated during July indicated that the plan of operating during the entire 24 hrs. was wasteful since the heat absorption through the party walls from the warm neighboring stores was nearly constant throughout the night. Moreover, there were several days in which no cooling would have been required for perfect comfort. It was decided, therefore, to operate

Filters Are Installed in Rectangular Duct at Right

during what might be considered as normal occupancy only.

During August, 1929, the fan was operated from 8 A. M. to 10 P. M. whenever the inside temperature was above 75° F. During this month 21 tons of ice were used. The mean outside temperature in July was 77° F., which was 0.3° F. above, normal, while in August the mean temperature was 75° F., which was 1.5° F. above normal. An average of the maximum temperature of each day in the month of July was the same as the average of the maximum temperature of each day in the month of August.

Building Can Be Maintained 10° Cooler Than Outside

Our experience and observation cause us to think that an office, store or residence having a calculated heat transfer of approximately 1800 B.T.U. per hr. per degree difference between inside and outside temperatures can be kept at an inside temperature of 75° until the outside temperature rises above 85° and then at a temperature at least 10° lower than the outside temperature by the use of approximately 64 tons of ice during the summer season at Omaha; that is from June 15 to September 15. Further, that such a building will require a maximum of approximately 2400 lbs. of ice per 24 hrs.

Ice used in this experiment was delivered at the same time and in the same way that other wholesale customers were served and while it created an increase in use in extremely warm weather somewhat greater in proportion to the average use than exists in the case of other wholesale customers, it is our opinion that this condition could be met, even for a considerable number of customers, without any material increase in the cost per ton for delivering the ice.

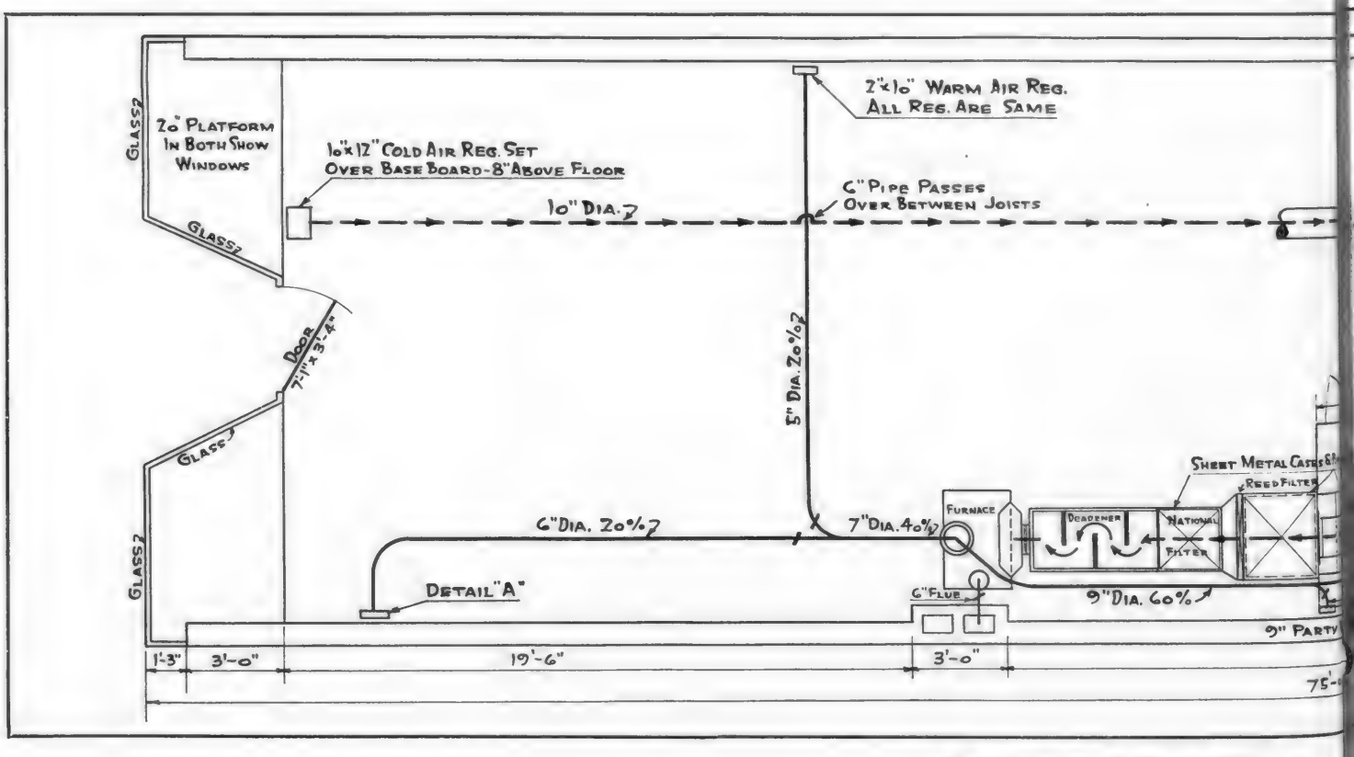
The purpose of this experiment was to determine, first, the feasibility of using ice for space cooling in hot weather; second, to derive a unit figure to permit of designing similar installations for other business places and residences; third, to derive a unit figure for estimating the probable cost of cooling such places per season. Tentative unit figures derived from this experiment are as follows:

The capacity of the cooler is to be based on 1.33 lbs. of ice per B.T.U. of heat absorption per hour per degree difference in temperature to be maintained between inside and outside temperatures.

An ice consumption of 3½ tons per season (June 15 to September 15), per 100 B.T.U. of heat absorption per degree difference in temperature.

The calculated heat absorption of the south side office is approximately that of an ordinary six-room residence, barber shop or neighborhood drug store. Ice used for cooling can be seconds and surplus and, at the price at which it can be sold in Omaha, will give a cost of cooling such structures between $200 and $250 per year. If installed as part of an existing forced circulating warm-air heating system, the cooler will cost approximately $200, or, if installed as an addition to an existing gravity warm-air heating system, will cost approximately $300, or if a complete installation is required, it will cost approximately $400.

If the cooperation of owners can be obtained, the district proposes to install five trial installations for use next year, one each in a barber shop, drug store and restaurant, and in two residences. As to restaurants, while the dining room sections may be cooled at reasonable cost, if little or no cooking is done in them, it is not practical to cool the kitchens because of the very great quantity of



Plan of the South Omaha Office

heat thrown off by the cooking processes.

Some unexpected conditions developed during this test at the south side office. One day at 2:30 in the afternoon, when the outside temperature at street level, but in the shade, was 102° F., the temperature in the office was 82° F. On this day, while it was very warm there was a slight haze and the sun was somewhat obscured.

On another day, at the same time in the afternoon, when the outside temperature was 101° F., the inside temperature was 91° F. All other conditions were similar, excepting that on the day with the lesser difference in temperature the air was very clear. There was no haze and the sun shone with unusual brilliance. It would seem that the difference in results obtained on these days was caused by the increased radiant heat from the sun effective upon the roof and front windows on the day on which the cooling effect was only 10° F. It was obvious that the direct rays of the sun on clear, bright days increase the heat input into the office very materially.

Another unexpected effect was that the higher the outside temperature, the greater the difference between the outside and inside temperatures. In the cool of the morning there might be only a small difference in temperature, but as the heat increased outside the difference became greater until a maximum difference of from 10° to 20° F. was obtained. It is probable that this was caused by utilizing the cooling effect of the cooled walls, floor, etc., and might not continue if the office were not cooled off artificially during the night or if the weather continued very warm for several successive days.

There was some question when this test was started as to the effect of cooling with ice upon the relative humidity that would exist in the office. It was found that, when the cooler was somewhat less than half full of ice, which gave an insufficient cooling of the air passing through the cooler, the humidity was too great for comfort, but when the box was more than half full, under which condition the temperature of the air leaving the cooler was between 35° and 40° F., the inside humidity was just about right for comfort.

Relative humidities were determined each hour of each day and were averaged for the morning and afternoon periods and compared with the relative humidity shown by the U. S. Weather Bureau as of 7:00 A. M. and 7:00 P. M. each day. The averages for the months of July and August, 1929, were as shown in the following table:

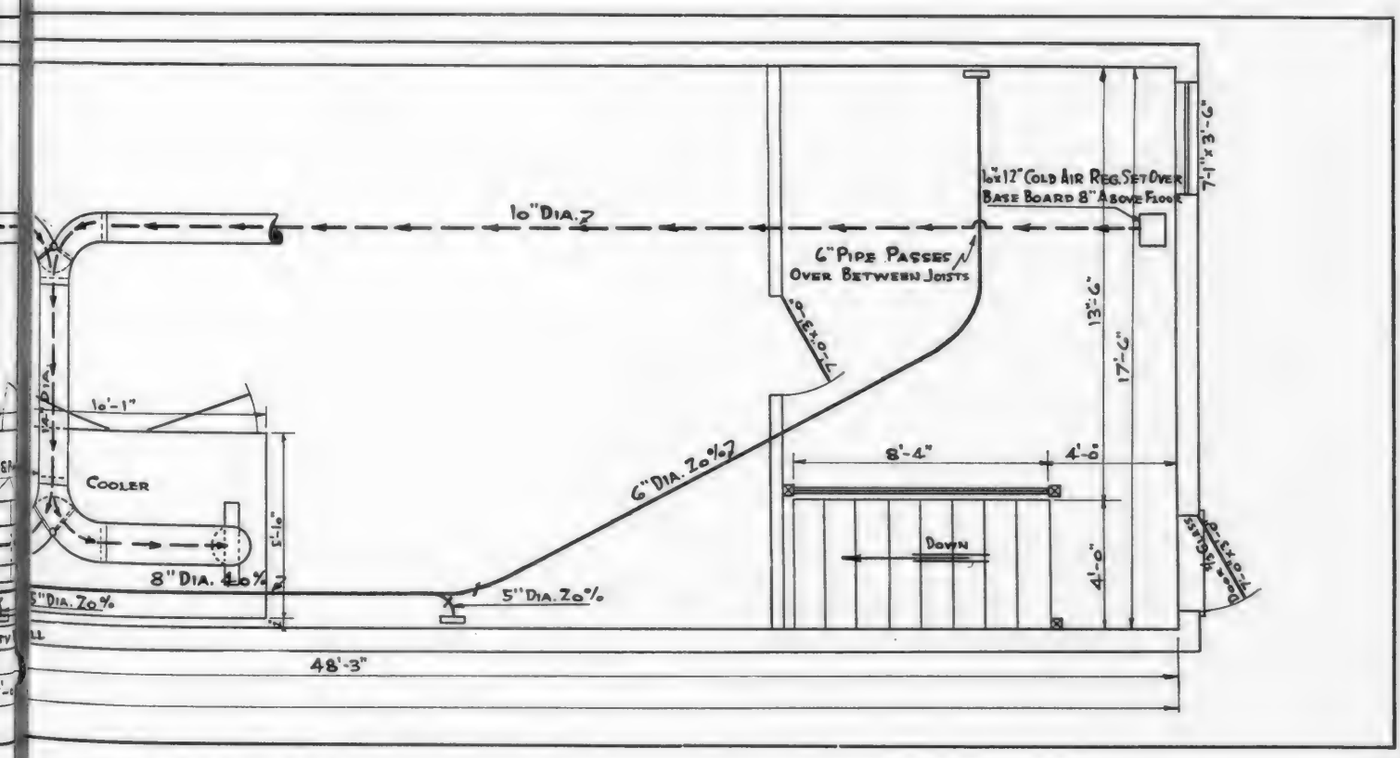
	Relative Humidity, Percent			
	Office		Weather Bureau	
	A.M.	P.M.	7:00 A.M.	7:00 P.M.
July	50.8	45.7	76.0	58.2
August	50.7	47.1	76.3	55.0

Another unexpected effect was the practical elimination of dust. The south side office is situated in a rather dusty and smoky section of the city. While prior to the use of ice for cooling it had been necessary to dust office furniture, equipment and appliances shown for sale at least once each day, after the cooling was started, all doors and windows being kept closed, dusting was required only once a week. The melting ice seemed to absorb nearly all the dust and dirt from the air.

Cooling Office Increased Efficiency of Workers

In this experiment cooling with ice had the effect of making the office entirely comfortable at all times. Clerks wore their coats with comfort and showed no indication of perspiration or discomfort throughout the entire summer. They stated that their physical condition had been better during the past season than in any other recent year.

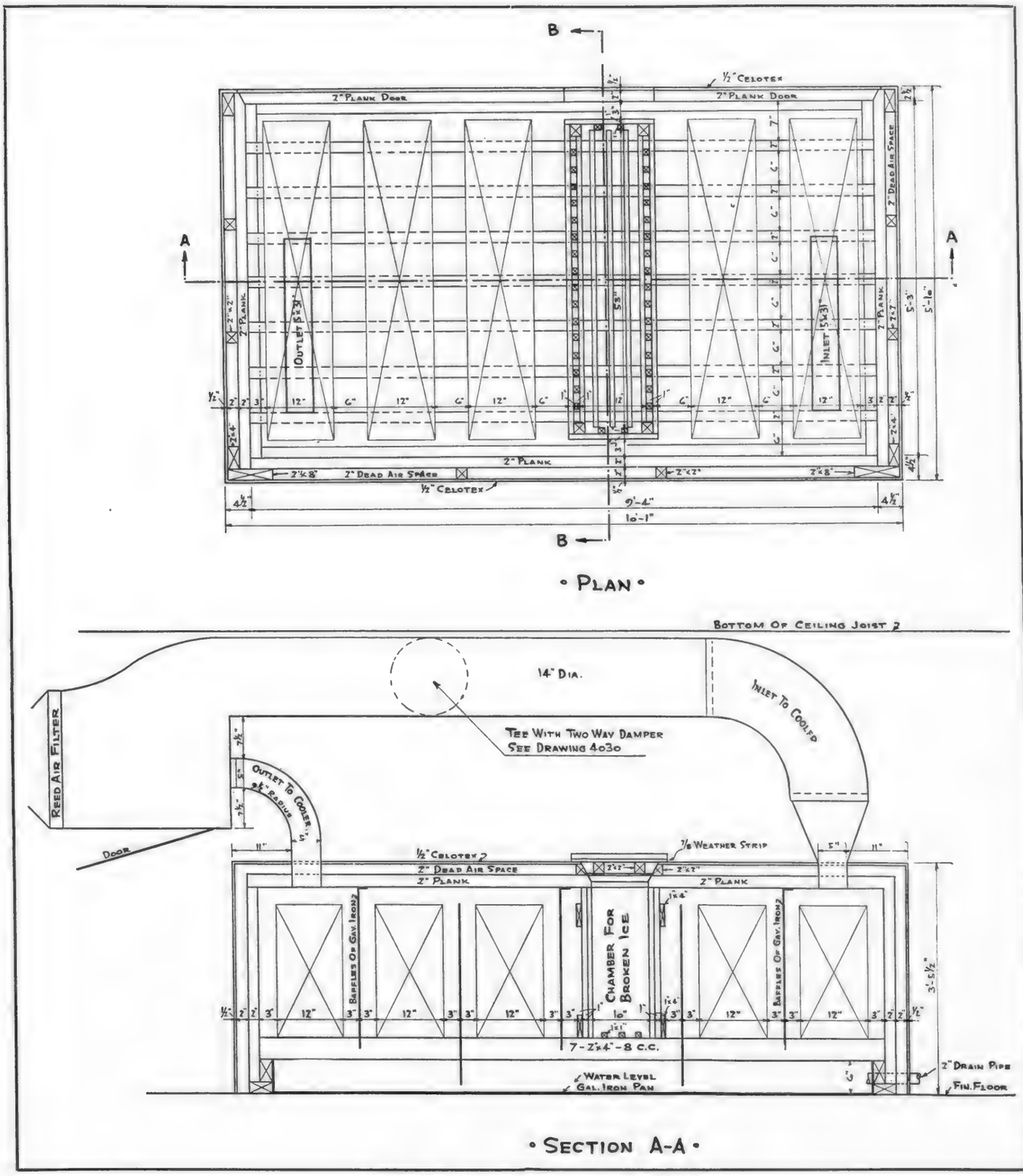
As part of its activities in operating the Gas Department the Metro-



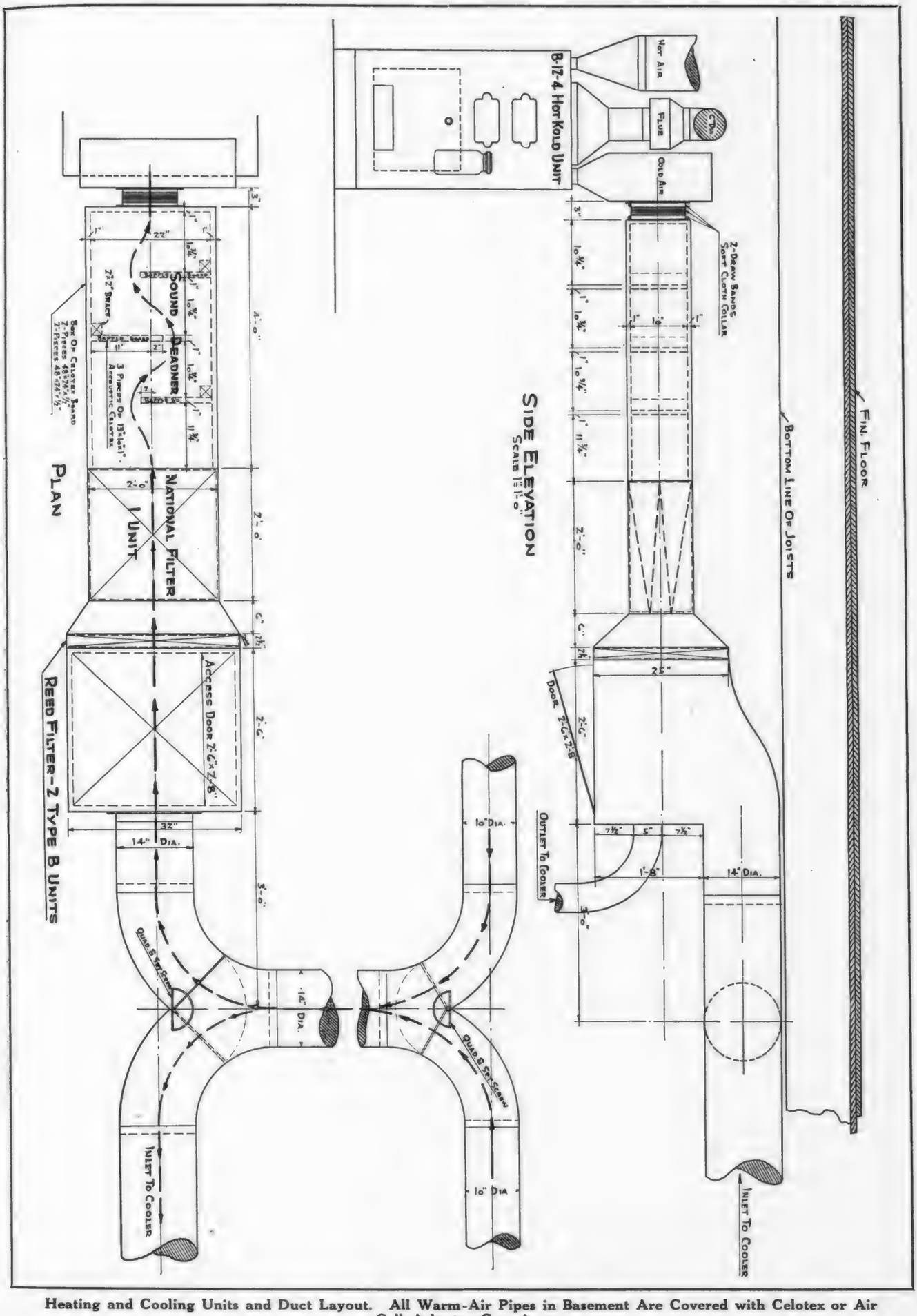
Which Is Cooled with Ice

politan Utilities District sells gas refrigerators. An investigation was made as to the possibility of cooling with this type of refrigerating unit. At this time there are no gas refrigerating units of sufficient size available and the cost of enough of the largest size units now on the market would be prohibitive, approximately twenty such units being required to cool this office. Using existing gas refrigerators burning 540 B.T.U. manufactured gas costing 60 cents per 1000 cu. ft., if gas refrigerating units of sufficient size ever are available, the cost of cooling structures with gas will be somewhat less than one-half the cost of using ice at $3.50 per ton delivered into the cooler.

With ice at $3.50 per ton, the trial installation described above seems to indicate that the cooling of structures of comparatively small size can be accomplished at a reasonable cost. When gas refrigerating units of sufficient size are developed, the cost of cooling will be within the reach of the great majority.



Plan and Section of the Cooling Unit



Heating and Cooling Units and Duct Layout. All Warm-Air Pipes in Basement Are Covered with Celotex or Air Cell Asbestos Covering

Estimating and Designing Heating Systems

by **F. W. HANBURGER**

Special Lecturer on Heating and Ventilation, College of the City of New York

AS the colored boatman told the college professor in the sinking boat, if he had not learned to swim all his education had been neglected. So, without a thorough knowledge of that principle in hydraulics which treats of the relation of friction loss to flow, we cannot hope to accomplish much in understanding our heating and ventilating science. In nearly every case where we find a failure to function in a heating system we can trace it to some violation of this law.

I am taking as simple and elementary a way as possible to explain this law in detail, tracing it step by step, and carrying a numerical calculation parallel with it. The reader should follow the calculation carefully and also work out the problems given later in this article. Answers to these problems will be given in the next installment.

Theory of Flow

We all know that to keep a body moving at a constant velocity over any surface a certain constant amount of force is required to overcome the friction between the two surfaces. The same law holds good for a fluid flowing over a surface. When the flow is through a pipe, this surface is represented by the area of the inside walls of the pipe, which we can term the rubbing surface.

Another law is that the force needed to do this increases with the area of the rubbing surface. As we increase the length of the pipe we must increase the amount of the force for the same amount of fluid flowing.

The amount of friction developed, and the amount of force needed to overcome it to keep a fluid moving at some particular velocity over a unit of area of pipe wall, can be determined by experiment. We can express this as the friction developed over a unit of area of the pipe wall at that particular velocity.

The force and the friction must be equal. This quantity is called the coefficient of friction and may be expressed by the symbol f. Its value depends on the density of the fluid and the roughness of the side walls.

For the purpose of this discussion and considering water as the fluid, the value of 0.0000015 may be taken as representing the force necessary to move water over 1 sq. ft. of steel pipe surface at a velocity of 1 ft. per min.

Now, with any given length and size of pipe it is an easy matter to find the force necessary to keep the water moving through it at the rate of 1 ft. per min. All we have to do is to multiply the rubbing surface by this coefficient of friction. The rubbing surface is the area of the inside wall of the pipe and may be expressed as

$$\pi \times D \times L$$

and the force must be

$$F = \pi \times D \times L \times f$$

where D is the diameter, L the length of pipe, both expressed in feet, and f is the coefficient given.

Taking a numerical example, for a 2-in. pipe 1000 ft. long, the rubbing surface would be

$3.1416 \times 1/6 \times 1000 = 523.6$ sq. ft., and the force will be

$523.6 \times 0.0000015 = 0.0007854$ lbs.

This 0.0007854 lbs. represents the total pressure that must be exerted on the entire pipe cross section at the starting end of a 2-in. pipe 1000 ft. long, to move the water through it at a velocity of 1 ft. per min.

Generally we must have a greater velocity than this. Assume that we wish to move the water at a velocity of 10 ft. per min. or ten times the original velocity. First, we would need make the pressure ten times as much to increase to this velocity alone.

But water transmits pressures equally in all directions and when we

Part I

In this series of articles, Professor Hanburger leads the young draftsman, engineer, steamfitter, and helper through the various steps necessary to qualify them to calculate and lay out any of the modern types of steam, vapor, vacuum or hot water heating systems.

Most of the material is based on the course in heating and ventilating which has been conducted with such success for several years at the College of the City of New York.

put on this extra pressure it is transmitted to the side walls and the resistance or friction becomes ten times as great. This demands another increase in force and, in general, we must increase the force as the square of the velocity. Thus, to increase the velocity ten times we must have 100 times as much force.

For any desired velocity, the formula now becomes

$$F = \pi \times D \times L \times f \times v^2$$

and, in the case of the numerical problem, if it were desired to have a velocity of 500 ft. per min., the total force necessary would be

$$F = 3.1416 \times 1/6 \times 1000 \times 0.0000015 \times (500)^2 = 196.35 \text{ lbs.}$$

This 196.35 lbs. represents the total amount of force that would need be exerted on the entire cross section of the pipe or on the rod of a piston plunger (Fig. 1) to force the water through a 2-in. pipe, 1000 ft. long at a velocity of 500 ft. per min.

For purposes of further calculation, however, it is necessary to express this force as so much pressure per unit of area. The more convenient unit is the square inch. Having the total pressure over the entire cross section, all that is needed is to divide this total pressure, F, by the area of the cross section, A, in square inches to obtain the pressure p, per square inch. In the problem we now have

$p = 196.35 \ (2^2 \times 0.7854) = 62.5$ lbs. per sq. in.

The formula would be expressed as

$$p = \frac{\pi \times D \times L \times f \times v^2}{A}$$

It will be well now to analyze the numerical problem. With water flowing through a 2-in. pipe at a velocity of 500 ft. per min., the quantity delivered will be the velocity times the area, in square feet. The diameter being 1/6 ft., the area will be

$(1/6)^2 \times 0.7854 = 0.0218$ sq. ft.

and the quantity is

$0.0218 \times 500 = 10.9$ cu. ft. or

$10.9 \times 7.5 = 88.8$ gals. per min.

As the pressure to force this amount of water through the pipe is 62.5 lbs. per sq. in., any condition that will produce this pressure will produce the result. Besides the method shown in Fig. 1, this pressure could also be supplied by a city supply main having such a pressure or by a tank having a head sufficient to produce it. The head in this case being $62.5 \times 2.3 = 143.75$ ft. (a pressure of 1 lb. per sq. in. raises a head of water 2.3 ft., or each foot of head requires 0.434 lbs. pressure). Both conditions are shown in Fig. 2.

Pressure Can Be Obtained in Two Ways

The reader should note that were the pipe connected to the supply main only and without the pressure tank, the conditions would be fulfilled, or that it would also be true with the tank alone and, lastly, that with both connections jointly it will still be the same, only 62.5 lbs. pressure per sq. in.

It is evident that 88.8 gals. is all that can be obtained through this pipe under the conditions because the resistance offered by that amount of water is 62.5 lbs. per sq. in. and that is all the force we have available. Again, it should be noted that if we desired twice as much water it would be necessary to have a tank four times as high, because the resistance increases as the square of the velocity.

Too, as the friction pressure loss varies directly with the rubbing surface, it varies directly as the length of the pipe. Therefore, with a total friction loss of 62.5 lbs. per sq. in. in this case for 1000 ft. of pipe, the loss of pressure for each running foot of length will be

$$62.5/1000 = 0.0625 \text{ lbs.}$$

This can also be taken in feet of head. In the problem the loss in head for the 1000 ft. is 143.75 ft., and the head lost per running foot of pipe is

$$143.75/1000 = 0.14375 \text{ ft.}$$

In Fig. 2, four riser pipes A, B, C, and D are shown at 250, 500, 750 and 1000 ft. from the source, and also a valve V is shown at the end of the pipe. If the valve is closed and no water flowing, the water reaches the same height in all the pipes, as shown by the water-line. When the valve is opened full and the flow becomes regular, the friction causes a loss of head at the different risers and the water drops to a corresponding level. In riser A, 250 ft. from the source, the loss is $250 \times 0.14375 = 35.9$ ft. and the head left is $143.75 - 35.9 = 107.9$ ft.

This is the height at which the water will stand in riser A. In B it will be 71.9 ft. and in C, 35.9 ft. At the terminal pipe D there will be no head left whatever. As a matter of fact, all these heads will be slightly greater, due to a velocity-head which will be discussed later. To avoid confusing the problem this has temporarily been omitted.

The heights at which the water stands in the several risers are marked AA, BB, and CC, respective-

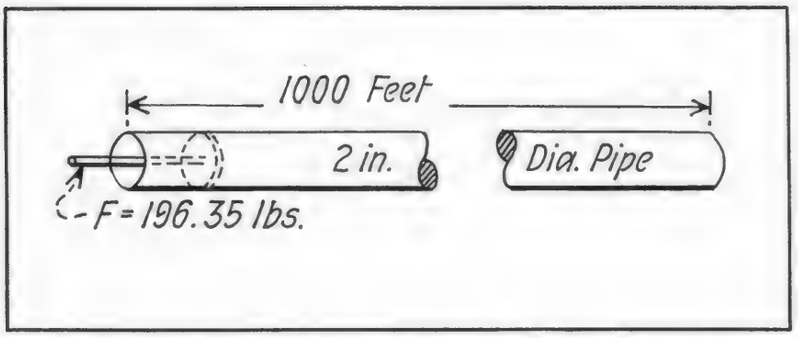


Fig. 1. Force Acting on Water in Pipe May Be Likened to a Piston

ly. The line connecting them is termed the hydraulic gradient. In Fig. 2 taps are shown on each riser at 80 ft. above the level of the outlet of the main pipe. It is evident that all would deliver a flow if the valve V were closed, but when this valve is open full, the only tap at which we could hope to obtain any water would be that on the riser A. This tap will still have a head of

107.9 — 80 = 27.9 ft. left, which is equal to a pressure of

27.9 x 0.434 = 12.1 lbs. per sq. in. at the tap.

So, it is seen, the calculations are not so extremely difficult. The main thing is to get a good diagrammatic picture of the layout and conditions and a good mental image of the actions involved.

Referring again to Fig. 2, it would be a simple matter to change the layout so that when the 88.8 gals. are being delivered at V we still would have sufficient pressure for practical purposes at the point CC. This would be accomplished by using a larger main from S to V so that the friction-loss would be less.

Practical problems often cause the calculations to become quite involved and so it simplifies the work very much to take our friction-losses from a chart prepared from some formula developed from experimental data. This not only makes the work easier but the results are more exact, owing to the fact that a coefficient, such as the one used, is not the same for all sizes of pipe. It varies somewhat with the ratio of the cross section area to the perimeter.

Water-Friction Pressure-Loss Chart

A chart of this nature is given in Fig. 3. It was constructed from a formula prepared by William Cox and published in the *American Machinist* for December 28, 1913. The friction pressure-loss per square inch per 100 ft. of pipe is shown at the bottom for varying quantities of flow, which are shown in gallons on the left margin and in cubic feet on the right.

Taking the data of the problem shown in Fig. 2, and referring to the chart, locate 88.8 gals. in the left margin. Then follow horizontally to the right until you intersect the line for the 2-in. pipe. From this point, drop vertically to the bottom of the chart and read 6.2 lbs. per sq. in. friction pressure-loss for 100 ft. of pipe. For a length of 1000 ft. the loss will be

10 x 6.2 = 62.0 lbs., as against the 62.5 calculated. To aid the reader, the above operation is traced on the chart with a dotted line.

To illustrate further the use of the chart, let us assume that we would wish to have a pressure of 10 lbs. at tap C on riser C in Fig. 2 while the supply of 88.8 gals per min. is being discharged at V. As this tap is 80 ft. above the level of V, we must then have a pressure at the bottom of the riser sufficient to maintain an 80-ft. head of water plus the 10 lbs. desired. This will be

(80 x 0.434) + 10 = 44.7 lbs. per sq. in.

As we have 62.5 lbs. available we can afford to lose

62.5 lbs. — 44.7 lbs. = 17.8 lbs.

in friction through the 750 ft. of main from S to the foot of riser C. This gives us a permissible loss of

17.8/7.50 = 2.37 lbs. per sq. in. per 100 ft. of pipe.

Referring to the chart, we locate approximately 2.37 at the bottom, move vertically upward until it intersects with a horizontal line brought over from a point equivalent to 88.8 gals. on the left-hand margin and find that it indicates a pipe slightly larger than 2½ in. It can also be found that by using a 2½-in. pipe, which is slightly small, we would only dare draw about 83 gals.

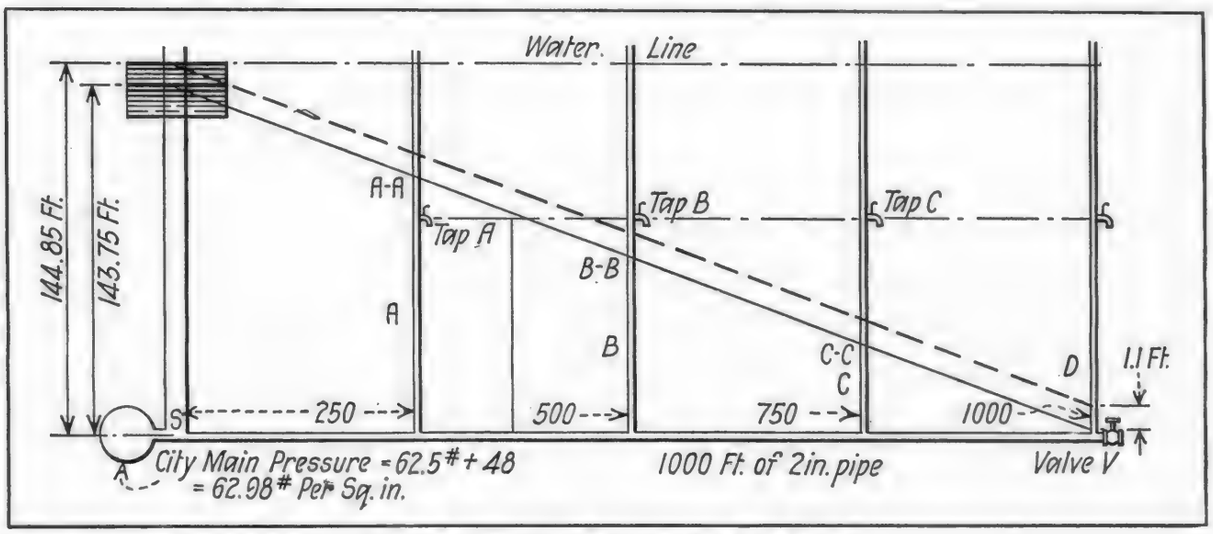


Fig. 2. Diagram Illustrating Loss of Head

per min. at V and still maintain the desired pressure at tap C.

Several problems are here given and the reader earnestly is advised to solve them. There is no other method that will bring a subject so clearly as that of self-teaching by solving practical problems. The solutions will be given in the next installment of this series, and any questions you may ask will be answered through these columns.

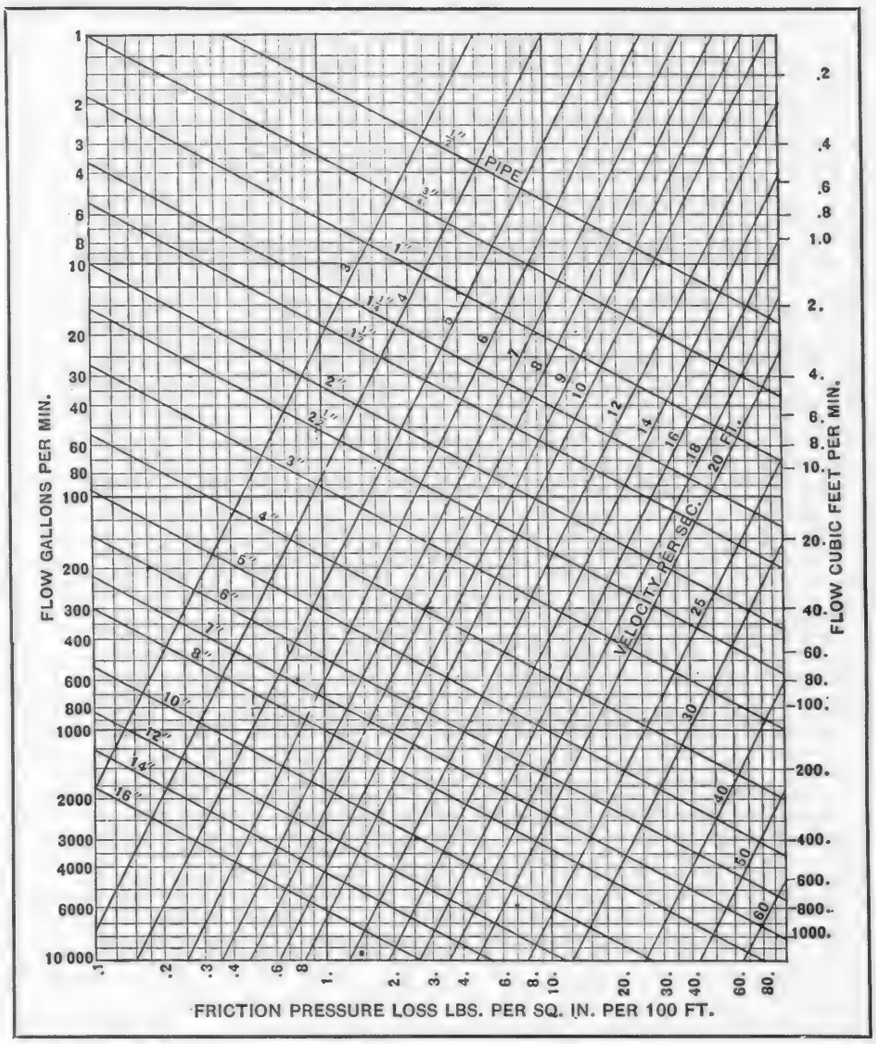
Problem 1. A client comes to you for advice saying that he is intending to open a factory in a building situated 250 ft. from the city supply main and the building is serviced with a 1¼-in. tap and service pipe. His cellar faucet is at the same level as the city main and there are times when he will need a supply of 150 gals. per min. from this faucet. The gauge pressure on the city main is 50 lbs. per sq. in. Is the 1¼-in. supply pipe large enough to supply this amount? If not, what size pipe would you suggest?

Problem 2. If you have used a different-sized pipe in the preceding problem, then with this new pipe, how high could you hope to obtain water in a building between the supply main and the factory, located directly along this line 160 ft. from the supply main?

Problem 3. If a pump is delivering 90 gals. of water per min. through a 1½-in. pipe, 260 ft. long, to a roof tank 90 ft. vertically above the pump, what will be the pressure per square inch on the piston in the water end of the pump?

Problem 4. What would be the pressure on the piston of the pump if the pump were discharging the same amount of water, through the same size and same length of pipe as in the preceding problem, but with the tank located so that its inlet is on the same level as the pump?

Notes: Referring back to Fig. 2, it will be noticed that we treated the problem as though there was no pressure whatever left at V, the end of the pipe, when the pipe was flowing full capacity. It is evident, however, that there must be sufficient pressure there to cause the water to leave the pipe at the velocity it does, namely, 500 ft. per min. The pressure-head, H, necessary to cause this flow is termed the velocity head and is found by the formula


FLOW GALLONS PER MIN.
FLOW CUBIC FEET PER MIN.
FRICTION PRESSURE LOSS LBS. PER SQ. IN. PER 100 FT.
VELOCITY FEET PER SEC.
PIPE
20 FT.

From American Machinist

Fig. 3. Flow of Water in Pipes

$$H = V^2/2g$$

where

H is the head in feet of whatever fluid is flowing

V is the velocity in feet per second, and

g is the acceleration of gravity in feet per second per second, or 32.16. Then for a velocity of 500 ft. per min., the velocity per second will be

500/60 = 8.3 ft., and the head to create this will be

$H = (8.3)^2/64.3 = 1.08$ or, say, 1.1 ft. Therefore all the heads in Fig. 2 must be increased by 1.1 ft. and, naturally, the pressures by

1.1 x 0.434 = 0.48 lbs.,

as is shown by the dotted gradient line. The total head in Fig. 2 then will be

143.75 + 1.1 = 144.85 and the total pressure at the main would need be

62.5 + .48 = 62.98 lbs. per sq. in. In the problems that have been given the calculated friction-head should be increased by an amount sufficient to create the velocity involved. In some of them tentative trial solutions may be necessary but it is best that the student discover this himself. To those to whom this formula

$$H = V^2/2g$$

is unfamiliar, I would suggest that they accept it as given for the present until it is discussed in the next installment.

Again, it should be noted that the total head is the sum of the friction-pressure and the velocity-head. The one can always be converted into the other. If we decrease the velocity of the flow in the pipe SV, Fig. 2, by partially closing the valve V, the friction-loss will be less and the water will rise in all the risers. In pipe D, instead of only 1.1 ft. to create a velocity, we will have a greater height, depending on how much throttling is done at the valve. The result is a smaller stream will emerge but at an increased velocity.

Heating Boston's First Set-Back Skyscraper

United Shoe Machinery Corporation Building, Boston, Mass.

THE new office building of the United Shoe Machinery Corporation, now under construction at the corner of Federal and High Streets, Boston, Mass., is noteworthy on account of the fact that it is the first building of the set-back type to be erected in Massachusetts. Previous to January, 1928, the building laws of the City of Boston limited the height of buildings to 155 ft. The amended law changed the situation, however, and this building will be 27 stories in height, in addition to basement and sub-basement.

In the sub-basement, which extends over the whole area of the building, are the boiler room, coal pocket, engineer's office and space for equipment for plumbing service, etc., besides a large vault and numerous storerooms for the use of tenants. The basement contains the upper part of boiler and coal rooms, building service locker and toilet rooms, switchboard room and ample storage rooms for the stores on the first floor.

Stores occupy the first floor, while the second to fourth floors are divided into offices for rental.

The fifth to eleventh floors, inclusive, are given over entirely to the offices of the various departments of the United Shoe Machinery Corporation, together with a portion of the fourth floor on which are located women's recreation room, lounge room, rest room, men's lunch room and kitchen.

All floors from the twelfth to the twenty-fourth, inclusive, are divided into offices which are to be rented.

The twenty-fifth floor contains fan room, etc., and the twenty-sixth and twenty-seventh floors are occupied by elevator machinery, vent flues, stack, etc.

Owing to the design of the building it was not found practical to carry the steam and return risers in an uninterrupted line from the lowest to the highest story. Consequently, two pipe spaces have been provided, one below the eleventh floor and the other below the twenty-first floor. This arrangement permits the installation of three separate systems of horizontal distribution mains.

The mains in the basement supply an up-feed system which furnishes steam to the radiators on all floors from the first to the tenth, inclusive. Those in the pipe space below the eleventh floor supply an up-feed system which furnishes steam to the radiators on the eleventh to fifteenth floors, inclusive. Steam is supplied to the radiators on all floors from the sixteenth to the twenty-fourth, inclusive, from mains in the pipe space below the twenty-first floor. In this case, the mains feed both up and down, the sixteenth to twentieth floors being down-feed and the twenty-first to twenty-fourth floors being up-feed.

The heating system is further subdivided into a total of eleven zones, each of which can be controlled separately from the engineer's office in the basement, as outside temperature, sun conditions, etc., may require. Three zones are allotted to the first ten stories, one each for south, east and west exposures. As the north wall is a party wall up to the eighth story, the north exposure is combined with the west exposure in one zone. Four zones are allotted to the group of floors from the eleventh to the fifteenth inclusive, one each for north, south, east and west exposures. Four zones are allotted to the group of floors from the sixteenth to the twenty-fourth, inclusive, one each for north, south, east and west exposures. With this arrangement it is hoped to obtain the utmost in flexibility and economy.

The system of control adopted for the various zones is the Tallmadge System. In this system a motor-operated control valve is provided for each zone. By means of graduated switch handles on the gauge board in the engineer's office, the volume of steam flowing through the valve can very closely be controlled. In order to

obtain uniform distribution of steam in the radiators in any zone, every radiator is provided at the supply inlet with an orifice bushing, having an orifice of proper size to suit the amount of radiating surface.

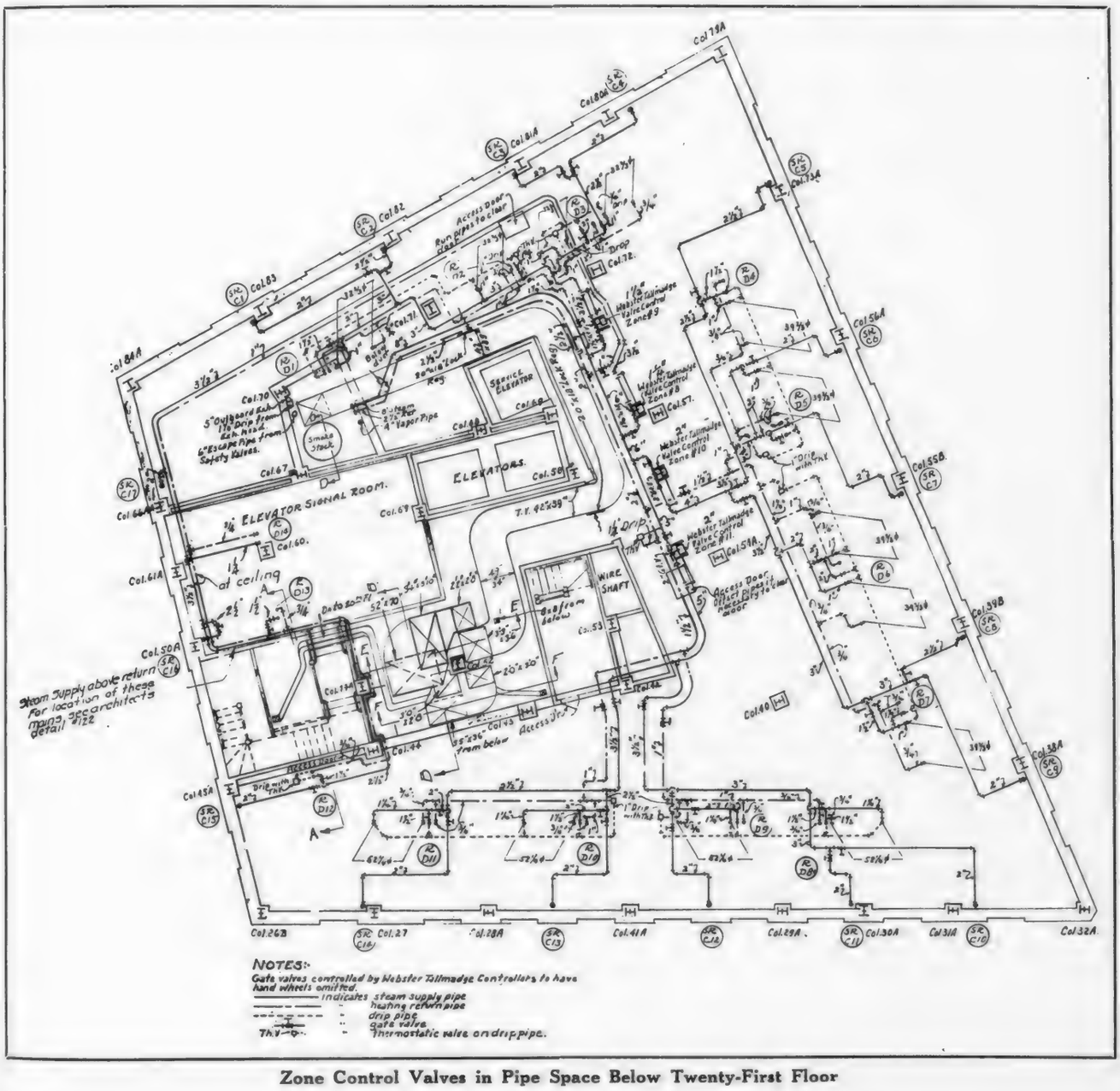
A Caliscope indicates the condition of each zone as to temperature and humidity. The indicator panel is located in the engineer's office. A key location has been selected in each zone, at which is placed a Humidoscope. On pressing the proper push button in the engineer's office, this instrument indicates to the engineer the temperature and relative humidity of the particular zone under observation. A comfort chart is furnished on the panel board as part of the equipment and reference to this enables the person in charge to operate the zone control valve previously referred to, so as to increase or decrease the volume of steam to the zone as conditions indicate.

In order that heating requirements may, to some extent be predetermined, a recording thermometer is installed on the panel board, which gives a continuous record of outdoor temperature.

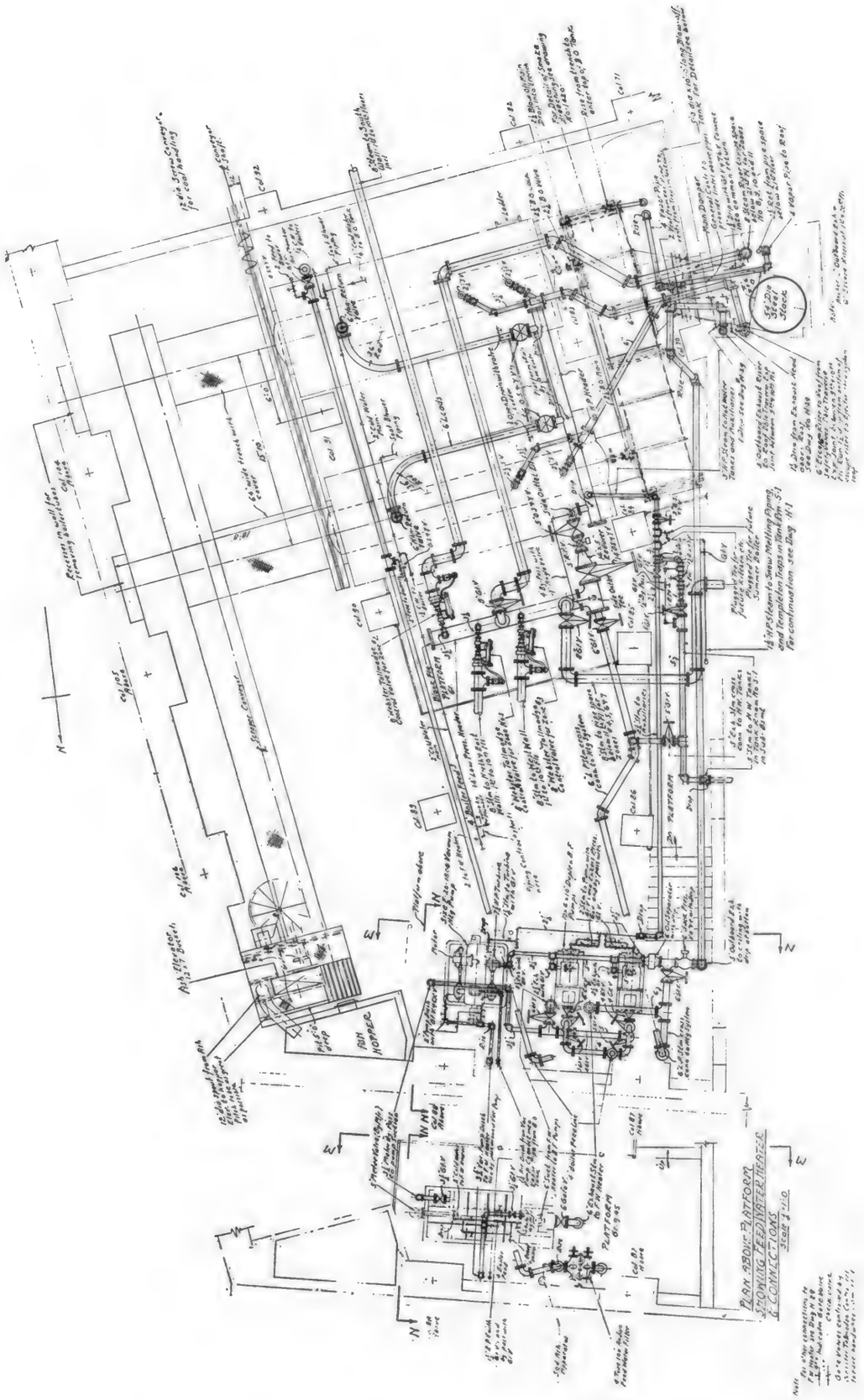
It will be noted from the above description that control of the heating system is manual. There seems to be no good reason to believe that the installation of automatic temperature control apparatus is necessary in a system of this nature. In fact, with reasonably intelligent operation more economy should be realized than is possible with automatic control as no opportunity is presented to the occupants for waste of heat.

An exception to this procedure is made on the eleventh floor, which is occupied entirely by the offices of the executives of the company. On this floor each office has been provided with a thermostat operating the radiator supply valves as well as the orifice. This permits each of these officers to have a room temperature to suit his own particular taste, irrespective of temperatures in other offices on the same floor or of the conditions which may have been decided upon as most desirable for that zone.

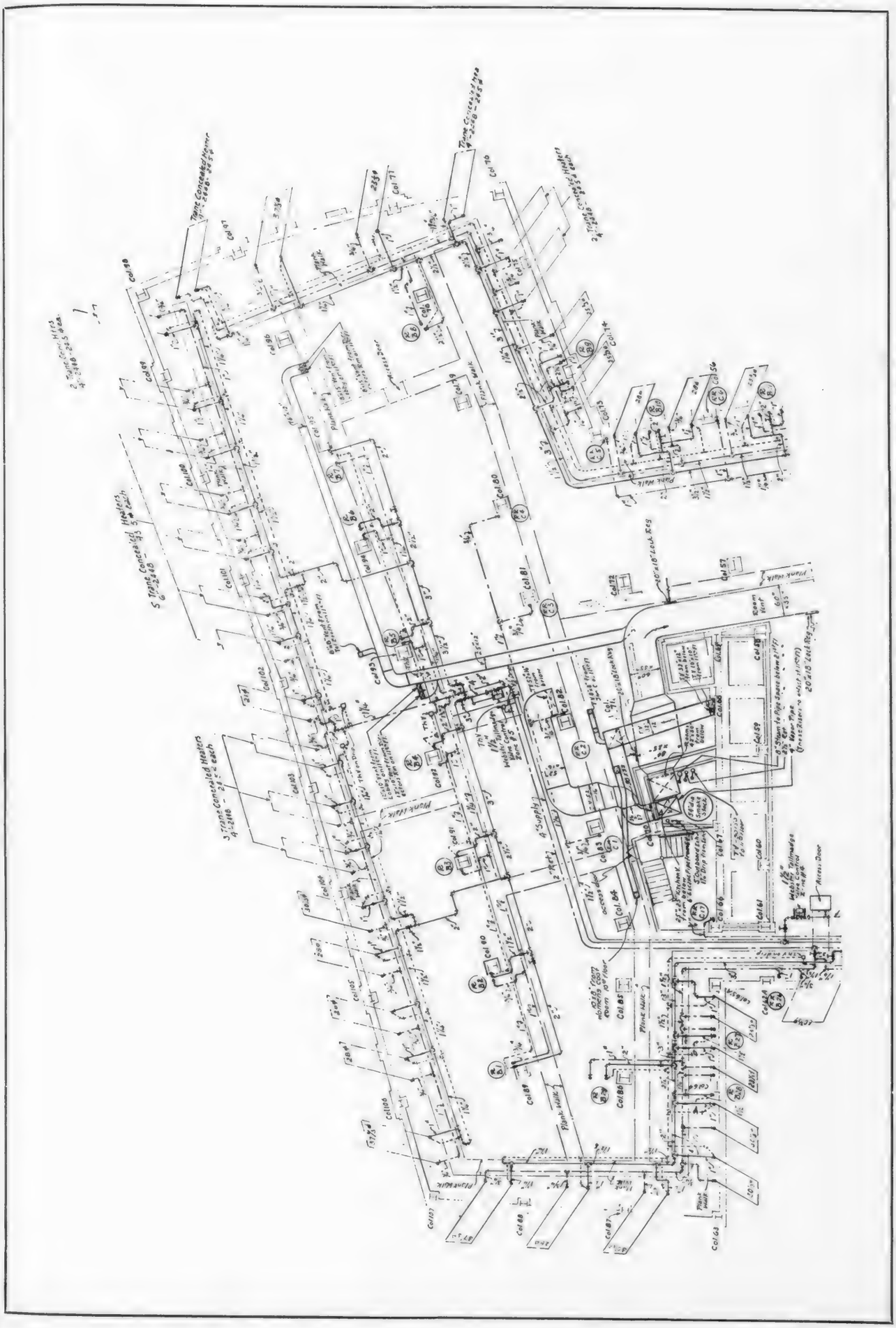
Steam is to be generated by two 250 H.P. B & W boilers at a pres-


ELEVATOR SIGNAL ROOM.
ELEVATORS.
Special ELEVATOR
Smoke Stack
WIRE SHAFT
Steam Supply above return For location of these mains, see architects detail #122
NOTES:
Gate valves controlled by Webster Tallmadge Controllers to have hand wheels omitted.
indicates steam supply pipe
heating return pipe
drip pipe
gate valve
Thermostatic valve on drip pipe.

Zone Control Valves in Pipe Space Below Twenty-First Floor



Arrangement of Zone Heating Controls in Boiler Room, United Shoe Machinery Building



Part of Eleventh Floor, Showing Pipe Space Below Floor and Valve Control for Zone 5

sure of 80 to 100 lbs. per sq. in. and supplied to the heating system through a reducing pressure valve at a pressure of 2 to 4 lbs. per sq. in. The decision to install boilers to operate at the above pressure, instead of using low-pressure units, was based on two factors. One is the ability to obtain greater efficiency with the type of boiler selected, and the other is the fact that it was impossible to determine in advance for what purposes the stores on the first floor might be rented. The possibility of leasing a part of this floor for restaurant, barber shop, candy store or other similar enterprise, where steam at 30 to 75 lbs. pressure might be required, was taken into consideration.

Each boiler is to be equipped with a Thatcher stoker, with a capacity for operating at 200% of nominal boiler rating. As the floor of the coal bin is 9 ft. above the level of the boiler-room floor, a screw conveyor was found to be both suitable and economical for conveying coal from openings in its floor and feeding it into the stoker hoppers.

Ashes Removed by Conveyors

An interesting feature of the design is the method of handling ashes. A scraper conveyor is installed in the bottom of each ash-pit. This conveyor runs in a trench below the boiler room floor, across the boiler room to discharge into a second and similar conveyor running at right angles to the first. This second conveyor discharges into the boot of a bucket ash elevator which is arranged to discharge the ashes, either into a waiting truck in the street at the rear of the building, or into a concrete ash-storage bin located in the corner of the boiler room. The same elevator is used to reclaim the ashes from the storage bin and discharge them to the street.

Heating returns are brought back to a Hytor duplex vacuum pump unit in the boiler room, each of the two pumps in the unit having ample capacity to carry the full load. One pump is driven by an electric motor, the other by a steam turbine.

The vacuum pump discharge is carried to a Cochrane open feed-water heater with V-notch meter. This heater also receives the returns from the coils in the water heating tanks and drips from the steam piping. It has been designed with liberal storage capacity to avoid the loss of hot returns when the system is started up or subjected to a sudden increase of load. The discharge from the meter is connected to the suction of two duplex boiler-feed pumps which, in turn, discharge to the boilers. Each pump has ample capacity to carry the full load.

The exhaust from vacuum and boiler-feed pumps is carried to the feed-water heater, with bypass to the heating main.

Careful consideration was given to the subject of ventilation and as the interior of the building has been so arranged that no partition is more than 30 ft. from an outside wall and all rooms have very liberal window space, it finally was decided that mechanical means for supplying fresh air would not be necessary.

A complete system of exhaust ventilation is provided, however, for all departments of the United Shoe Machinery Company. The various vent ducts are collected and conducted to two large vent shafts, one of which passes up through the entire height of the building, the other as far as the twenty-first floor. A fan room is located on the twenty-fifth floor and here the main vent duct is connected to the main exhaust fan which discharges through the roof through a vertical flue.

In the same fan room is to be located the toilet vent fan. This fan exhausts through a separate duct system from toilets, locker rooms, coat rooms, etc., and discharges through the roof.

It was impossible to provide in advance a comprehensive system of ventilation to meet the needs of individual tenants. The most that could be done was to make provisions so that as the requirements develop they can be met. To provide for this condition, the main vent ducts in the vertical vent shafts have been made of sufficient size to carry any reasonable load which may be imposed in the future. The fan, motor and speed regulator have been selected also with future requirements in view.

All pipe spaces below the eleventh and twenty-first floors are of minimum depth to house the equipment they contain and are necessarily fairly crowded with steam piping, etc. In order to prevent unpleasant transmission of heat through the floor construction above it was necessary to devise some means of ventilating them. Experience in other buildings of similar type has shown that the problem can satisfactorily be solved if free circulation of air can be provided. Usually this has been obtained by placing louvered openings in the outside walls at intervals, opening into such pipe spaces.

In this building, however, architectural considerations precluded this arrangement. Grilles have been located at a number of points in the ceilings below the pipe spaces and openings with adjustable slide dampers have been made in the vent ducts passing through the spaces. It is expected that satisfactory results will be obtained by this arrangement.

It is intended to control the fresh air entering the building through the windows by some form of window ventilator. For this purpose the Siefken ventilator has tentatively been decided upon.

Indirect Radiators Are Placed in Vestibules

There are two main entrances to the building, one on Federal Street and one on High Street, and to overcome the effects of cold blasts of air entering the main corridors every time the doors are opened, concealed radiators of the Vento indirect type are located on each side of each vestibule. A fan in the basement forces a current of air over these radiators in cold weather. By this means the strong current of air induced in the corridors by the elevator shafts is tempered to a comfortable degree.

The building contains a total of 5,352,600 cu. ft. and covers an area of 29,163 sq. ft. A total of 41,000 sq. ft. of direct radiation and 500 sq. ft. of indirect radiation is provided.

The building was designed by Parker, Thomas and Rice, architects, of Boston, with Henry Bailey Alden as associated architect. Hollis French and Allen Hubbard, of Boston, were retained as consulting engineers, and the design of the heating and ventilating system was in charge of P. A. L. Foulds, of the latter organization.

New Ventilation System for Sleeping Cars

by **A. C. BLACKALL**

A NOVEL and exceedingly effective system of ventilation has recently been introduced by H. N. Gresley, C.B.E., the chief mechanical engineer, on the sleeping cars in the service of the London & North Eastern Railway—one of the four main systems of the United Kingdom. The principle of Mr. Gresley's system is to supply fresh air into each sleeping car in such a manner that the air can be delivered in any direction and in any such quantity as the passenger desires.

Air pressure is obtained by means of noiseless electric fans fixed one at each end of the corridor roof, as shown in one of the accompanying drawings. These fans maintain a constant pressure of air in a metal-lined air duct which extends over the full length of the corridor. A partition at the center divides the duct into two portions, so that each fan serves five compartments.

Air is delivered into the compartments by nozzles carried above the corridor doors, as indicated in the other drawing. These nozzles work in a ball and socket joint, the direction of the air being controlled by the position of the nozzle, which can be altered at will by the passenger. A milled nut at the side of the nozzle operates the shutter, and thus the volume of air delivered can be modified to meet individual requirements, or, if so desired, the air can completely be shut off. By this arrangement, in conjunction with the louvre ventilators, drop lights and roof extractors, it is possible to obtain a constant circulation of fresh air, to the added comfort of the occupants of the compartment.

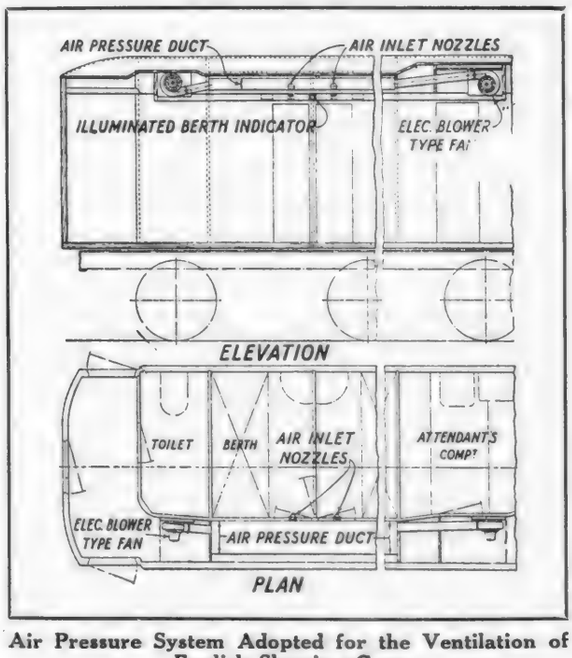
The same railroad also has recently introduced into the berths of its sleeping cars a new form of sliding shutter designed by Mr. Gresley, to replace the blinds and curtains that were previously fitted over the side windows, and which, for obvious reasons, could not be kept as clean as desired. The sliding shutter is constructed of mahogany, and the general design conforms with the panelling of the compartments.

The shutter is carried on spring rollers in vee-shaped guides so as to ensure smooth and silent movement. Louvred openings are formed in the top half and are so arranged as to come opposite the louvre ventilator in the side window when the shutter is in the closed position.

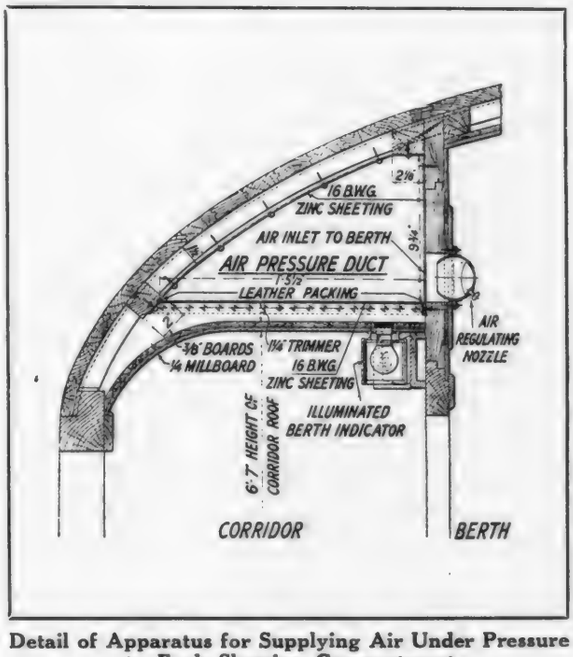
Mirror Used to Prevent Drafts

A frameless mirror, with an air space at the back, hides the louvres in the shutter and adds to the general appearance of the compartment. Moreover, while not interfering with the efficiency of the shutter as a ventilator, it prevents drafts.

The louvre ventilator in the side window is controlled from inside the compartment by a lever above the shutter. The side light is lowered or raised by an inside hand-operated window lift. Consequently, the passenger has complete control of both ventilator and window without touching the sliding shutter.



Air Pressure System Adopted for the Ventilation of English Sleeping Cars



Detail of Apparatus for Supplying Air Under Pressure to Each Sleeping Compartment

Modern Steel Breaker in Anthracite Region

Anthracite—Its Future in Automatic Heating

by **NOEL CUNNINGHAM**

IN this day of rapid changes probably no more complete reorientation is taking place than in the production, merchandising and house-heating application of Pennsylvania anthracite. At the time the Anthracite Research Bureau began to function in January it was the general opinion among the responsible heads of the producing companies that users of anthracite would continue to be satisfied with hand firing of large sizes provided these sizes are maintained in the pure state which refinements in methods of preparation have made possible. It was confidently stated that mechanicalization in household use of anthracite need go no further than automatic removal of ashes and automatic damper regulation.

Today, only eleven months later, the industry as a whole is swinging to the opinion that, within a few years, the large sizes will be all but out of use. The demand will be for the small buckwheat sizes, with means for automatic coal feed in quantities depending on the changing heat requirements of the house, and provisions made for the automatic removal of ashes.

Throughout Northeastern United States the requirements of two classes of householders control the house-heating situation. There are, first, the minority of users who can afford luxury fuels and, second, the large majority who are unable to pay an exorbitant price but whose requirements are for automatic heat. The development of the buckwheat burning automatic stoker has made it possible to meet the demand for automatic heat with anthracite, so that the requirements of both these groups can be met. Were this not so it appears probable that hard coal could

Radical changes in the merchandising of coal, decreased production costs in the anthracite fields, and a widespread use of stokers for domestic heating plants are forecast by Mr. Cunningham. He tells of one coal dealer who is selling heating service by assuming the full care and responsibility of supplying and firing the coal, cleaning the boiler, and removing the ashes. Will this unique policy enable the anthracite industry to compete with oil and gas in the keen competition for the business of the consumer who demands automatic heat?

This article represents the anthracite viewpoint. Subsequent articles on bituminous coal, oil, gas and electricity and their relation to automatic heat will deal with the subject from the viewpoint of their respective advocates.

maintain itself on the market only for so long a time as would be required for the oil burner or gas interests to convert or replace the present coal burning heaters.

The house-heating situation in the Middle Atlantic and New England States is developing into a triangular fight for supremacy. Anthracite is being used in five million households; oil-burning has awakened an insistent demand for automatic heat which the accustomed use of the large sizes of anthracite, hand fired on grates, cannot satisfy; gas heating is looming large as a competitor to both anthracite and oil. The fact that anthracite is already in so nearly universal use, places it in a strong position. Oil-burning has a running start on gas, but, in my opinion, is handicapped by tactical errors made during the past few years; the gas industry is so carefully avoiding making these same errors that, so far, their progress has been comparatively slow.

Industrial strength of the three contenders will have much to do with the outcome. Anthracite, although the profits have been meager during the past four years, has become solidly intrenched during nearly a century of previous highly profitable operations. The interests of the anthracite operators are interwoven with those of a compact, highly developed, progressive and alert section of the country. The business men throughout the producing area are thoroughly alive to the situation and to their own stake in the outcome. Membership in the Anthracite Co-operative Association, an active force, unique in business annals, consists of practically every man of means and influence within the producing area. Great banks, not only in Scranton, Wilkes-Barre, Hazelton and Pottsville, but also many in Philadelphia and New York, are extremely interested in maintaining anthracite and, if possible, improving its present status. While oil-burner and gas interests, too, are backed by tremendous capital investments, they have not, as has anthracite, become part of the life and livelihood of any great section of the country.

Overproduction of Oil in Recent Years

To some extent oil burning in the home is shadowed by the menace of oil production curtailment. Recent years have been characterized by an overproduction of oil, now at a peak. Oil is too valuable as a natural resource to allow such overproduction to continue and curtailment cannot possibly have an effect other than to raise the price of refined products. Development in the application of oil for automobile fuel, the fuel requirements for aviation and hydrogination as effecting refining practice are all factors which tend to emphasize the character of the obstacles which may beset the path of the oil burner. It is admittedly a fact that oil in household heating has been revolutionary in its effect upon established house-heating habits; it is also true that a material increase in the cost of oil for house-heating will tremendously handicap the continuance of oil-burner development.

Gas rates for house-heating are a paramount factor in effecting the extent to which this fuel can be utilized. The price situation is complicated by a maze of uncertainties. Curtailment of oil production and importation, and consolidation of bituminous coal mining interests will go far towards establishing higher bituminous coal prices. The ten-year stagnation of the bituminous business cannot continue indefinitely and reasonable prices for bituminous coal probably will be reflected in higher costs in gas manufacture. The cost of suitable mains added to the present high fixed charges is also of considerable importance, militating against any marked decrease below present prices for gas.

Future ideal utilization of manufactured gas is for industrial uses, and it is the opinion of many that the East is on the verge of a tremen-

Hand-Picking Lump Anthracite in Breaker, Kingston, Pa.

dous expansion in this direction. Where comparatively short mains can deliver gas to industrial plants at high load factors the multiplicity of small users makes this business less attractive to the utility. Gas for house-heating even as low as 65 cents is expensive as long as equal comfort can be obtained at a lower cost.

An interesting experiment in strengthening anthracite against competition is the recent formation of the Anthracite Equipment Corporation. The stock is subscribed by the heads of a group of producing companies composing the Anthracite Operators Conference and it is the intention that the company will function with minor reference to direct profits, the purpose being to bring prominently before the consuming public such devices as have been approved by the Anthracite Research Bureau. As showing the trend of thought in this direction, the first device so far approved is an automatic buckwheat stoker applicable to all present forms of heating equipment.

This machine automatically feeds coal from a storage hopper at rates varying with house-heating requirements and removes the ashes dustlessly to a can above the cellar floor. One other device has so far been approved, a new, ingeniously simple, full-floating heat control. Thus, as showing what a "backward" industry can do when aroused, we see a decided rearrangement of policy to meet the changing customer situation, and made with a promptness which has probably never before been approached in big business.

Wet Screening Small-Sized Anthracite

Assuming that standardization on small sizes of anthracite actually develops, the most important effect will be to bring automatic heat within the reach of every building owner. The benefits to be derived will not only affect further utilization of anthracite but will introduce large savings in cost of production.

At present the whole art of anthracite production centers on elimination of breakage. Veins, the coal from which tends to break down to small sizes in handling, are often now left in the mine, even when the removal of veins above has minimized the heavy item of development cost. In mining, anthracite is "pushed" down with a large number of light, timed face shots using low per cent dynamite in order to produce a maximum of lump coal. When production of a high lump yield becomes immaterial a considerable saving will be accomplished in cost of mining. Underground handling, hoisting and dumping are all more expensive at present because of the effort to maintain a high proportion of lump.

Loading Anthracite at the Face in a Pennsylvania Mine

Preparation plant investment will be tremendously reduced when breakers can be built without present elaborate equipment for reducing breakage of coal and for maintaining production in the larger, prepared sizes. Even greater than the savings in mining and plant cost will be those made possible in preparation, sales expense and dealer costs.

Greater returns to producers, labor and business will allow increased development of equipment, extension of activities in consumers' service and education of the public to obtain the greatest possible satisfaction in using anthracite. Sales can thus be still further augmented and many of the seasonable characteristics so troublesome at present can be eliminated.

One very important development in automatic heat with anthracite is already an established fact. During eight years the buckwheat burner recently approved by the Anthracite Research Bureau has been coming into steadily greater use. By the end of the present heating season between twelve and thirteen thousand will have been installed, and those now in use are giving general satisfaction throughout the entire anthracite consuming territory. A large number of these have replaced oil burners and recently many have replaced gas-burning equipment in localities selling gas as low as 65 cents per 1000 cu. ft. Apparently the machine can meet any competition which so far has developed, and, with unqualified support from the anthracite producers and dealers, it should be a vital factor in increasing anthracite tonnage.

Coal Dealer Sells Automatic Heat

A plan which has been thoroughly tried out and which is now being extensively applied provides entirely automatic operation so far as the customer is concerned. The coal dealer sells heat instead of fuel. The customer at his own expense, on a financed basis if he prefers, has his heater equipped with a stoker and thermostatic control. The coal dealer provides a service department which attends to the filling of the coal storage hopper, removal of ashes and maintenance of the stoker and heating plant.

After each heating season the stoker, heater and cellar are thoroughly vacuum cleaned and the plant put in first class condition. All insulation is gone over, the boiler covering given an asbestos wash and the boiler front a coat of paint. For this service the coal dealer merely adds an additional cost to the price per ton of coal delivered.

With this additional charge the price of coal is about half way between that of large sizes of anthracite and the price of buckwheat. Thus the customer pays from three to four dollars less per ton than he has been paying for large sizes of anthracite and has, so far as he is concerned, automatic heat throughout the heating season.

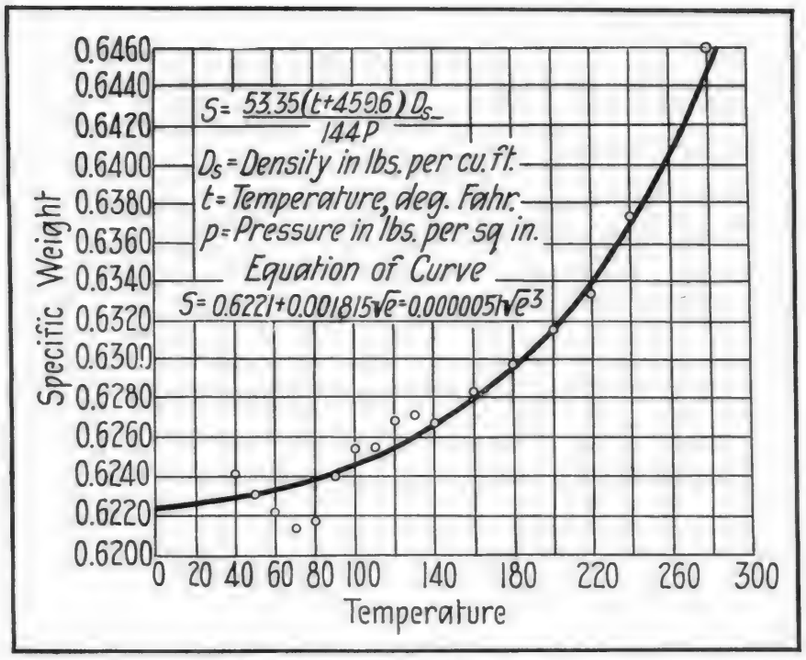
How rapidly the aroused desire for automatic heat will overcome the inertia on the part of a considerable proportion of householders depends upon a number of general as well as local factors. Methods of merchandising vary tremendously. In this respect there is a marked difference between the way in which gas for house-heating and the oil burner are being marketed. The gas industry, with an occasional exception, is building on the sound basis of subordinating present results to the expectation of an assured future business.

The number of oil-burner installations in any particular area has varied and still varies with the sales aggressiveness of local dealers. Unfortunately sales aggressiveness and service ability are not always equally balanced so that the number of installations in any particular locality is subject to strong spurts followed by periods of reorganization. Those who fall by the wayside after making some money in sales and losing it in service have to be replaced by new aspirants. These come on like waves on the beach, illustrating the fearless nature of a certain class of the younger generation of American business men.

The anthracite industry has only so recently appreciated the fact that it is being seriously attacked that no very general policy has been developed. Some one has said that China cannot be conquered, since it is an immense country, thickly populated, without any closely connected vital points for attack. There are indications of a modernizing spirit in China and what is true of China is true in many ways of the anthracite industry. Leadership is developing, and there are indications that many of the adversaries' weapons may be used effectively, not only to frustrate disaster but to acquire additional territory.

V. Hagopian, Architect

Detail of Radiator Grille in the A. S. Beck Shoe Store on Fifth Avenue, New York, Extending from Floor to Mezzanine



Specific Weights of Water-Vapor

Mr. Carrier's paper divides itself naturally into four sections, the first taking up, in a general way, the air-conditioning requirements of various manufacturing processes; the second, the physical principles of air conditioning; the third, a review of the experimental work at the A. S. H. V. E. Research Laboratory on human comfort and "effective temperatures," and the fourth, modern air-conditioning equipment.

In the accompanying abstract are given some of the physical principles involved. Subsequent issues will contain the balance of Mr. Carrier's discussion of the physical principles and the section on modern air-conditioning equipment.

Control of Humidity and Temperature

by **WILLIS H. CARRIER**
President, Carrier Engineering Corporation

Physical Principles

THE usual requirement in air conditioning as applied to processing hygroscopic materials is to maintain a definite relative humidity. In other instances it is desired to control merely a definite moisture content of the air.

In problems involving human comfort, it is necessary to maintain certain limiting or desirable "effective temperatures" which depend upon the experimentally-determined relationships of wet- and dry-bulb temperatures and air motion. Briefly, those are the requirements in various phases of air conditioning and the terms should properly be defined in order that the following discussion may be clear.

It should be noted first that the moisture content in a given space is independent of the maximum quantity of air or other gases present. In other words, the properties of saturated water-vapor are assumed to be in no way affected by the presence of other gases. Therefore, the quantity of moisture present in a given space may be determined directly from the data available or the physical properties of water-vapor.

As is well known, the vapor pressure of water and, consequently, the weight per unit of volume of that vapor, depends upon its temperature. Vapor pressure and density curves and tables are available for all the ranges of atmospheric temperature, and the accuracy of these can probably be relied upon.

Where the vapor pressure of the water-vapor present is known, it is evident that the proportionate weight of water-vapor to other gases in the mixture obeys Dalton's law, assuming, of course, that they have no chemical affinity. This may be expressed by the relationship:

$$W = \frac{Se}{P-e}$$

where

W = weight of moisture per pound of air.

S = specific weight of water-vapor compared with air as 1.

P = barometric pressure.

e = vapor pressure at temperature t.

If other gases than air are present, then the specific weight of water-vapor must be taken as the density of the water-vapor with reference to the density of the gas at the same pressure and temperature.

The theoretical specific weight of steam, assuming that it obeys the gas laws, would be the ratio of the molecular weight of steam to that of pure dry air. At low temperatures the actual specific weight approaches very closely this theoretical, while at high temperatures the deviation is considerable. The curve of actual specific weights of water-vapor is shown in the illustration.

From this, it is possible to compute with accuracy the weight of water vapor contained in a pound of dry air at any given vapor pressure and barometric pressure.

In a mixture of air and water-vapor, a point is reached where there is a maximum quantity of water-vapor present for any temperature; that is, the air is saturated when the vapor pressure corresponds to the temperature.

Air, however, is usually deficient in water-vapor. That is, it is unsaturated, in which case the vapor pressure is

From a paper presented at the World Engineering Congress, in Tokio, Japan, November 7, 1929.

lower than the maximum corresponding to the temperature of the mixture. The ratio of such vapor pressure to the vapor pressure of the mixtures when saturated at that temperature is termed the *relative humidity*. That is:

$$\text{Per cent relative humidity} = \frac{e}{e_t} = \frac{D}{D_t} \text{ (approximately)}$$

where e and D are the pressure and the density, respectively, of the vapor in the air, and e_t and D_t are the saturation pressure and density, respectively, of the vapor corresponding to the temperature t of the mixture.

Dew Point

If such an unsaturated mixture of air and water-vapor be cooled, without the removal of any moisture present, it will ultimately become saturated. This temperature is termed the *dew point*, for any further cooling will result in a deposition of moisture from the mixture.

Temperature of Evaporation

In the instance cited, the air was saturated by withdrawal of heat and without change in the moisture content.

Air may also be saturated adiabatically, that is, by being brought into contact with the liquid itself and without any addition or subtraction of external energy. Under this condition water vaporizes into the space occupied by the air, and assuming that no heat is available from the water itself. That is, no temperature change takes place in the water present, the heat required for change of state must come from the sensible heat in the air itself, thus resulting in the lowering of its temperature.

The moisture content of the air, therefore, is increased and its temperature lowered simultaneously, and it is obvious that the increase in latent heat must exactly equal the decrease in the sensible heat of the mixture. Further, this process will go on until the air becomes saturated where no further exchange between the sensible and latent heat is possible. This final temperature at which adiabatic saturation takes place in any body of air of known temperature and moisture content is known as the *temperature of evaporation* and corresponds to the *wet-bulb temperature*.

So that no heat exchange may take place between the water and the surrounding air, it is necessary that the water be introduced at this temperature of evaporation. On the other hand, if free water is exposed to a continuous current of air of such a given temperature and moisture content, it will ultimately assume of its own accord this equilibrium temperature of evaporation. This is not only logical, but has been proved experimentally. It is for this reason that an ordinary thermometer which has its bulb covered by a wetted cloth, or otherwise coated with the liquid will, if protected against outside sources of heat such as radiation and subjected to a stream of air having a definite temperature and moisture content, indicate the temperature of adiabatic saturation. This proves the identity between what is termed the *wet-bulb temperature* and the *temperature of adiabatic saturation*.

In the ordinary sling psychrometer, which is used in measuring the moisture content of air, however, there is always some radiation present and, if the wet-bulb be not strongly ventilated, this error may be considerable. With strong ventilation, however, the radiation effect is usually less than 1%.

From the foregoing discussion, four fundamental principles in air conditioning may be evolved:

1. When dry air is saturated adiabatically the temperature is reduced as the absolute humidity is increased, and the decrease of sensible heat is exactly equal to the simultaneous increase in latent heat due to evaporation.

2. As the moisture content of air is increased adiabatically, the temperature is reduced simultaneously until the air is saturated, when no further heat metamorphosis is possible. This ultimate temperature may be termed the temperature of adiabatic saturation.

3. When an insulated body of water is permitted to evaporate freely in the air, it assumes the temperature of adiabatic saturation of that air and is unaffected by convection, i.e., the true wet-bulb temperature of air is identical with its temperature of adiabatic saturation.

4. The true wet-bulb temperature of the air depends entirely on the total of the sensible and the latent heat in the air and is independent of their relative proportions. In other words, the wet-bulb temperature of the air is constant, provided the total heat of the air is constant.

It will be obvious in considering the foregoing process that a formula relating the latent heat change to the sensible heat change establishes the relationship of this theoretical wet-bulb temperature to the temperature and moisture of the air. This was first pointed out in the rational psychrometric formula:[1]

$$r'(W'-W) = C_{pa}(t-t') + C_{ps}W(t-t')$$

in which

$(t-t')$ = the true wet-bulb depression

$(W'-W)$ = moisture absorbed per pound of pure air when it is adiabatically saturated from an initial dry-bulb temperature t_o and an initial moisture content W

C_{pa} = mean specific heat of air at constant pressure between temperature t and t'

C_{ps} = specific heat of steam at constant pressure between t and t'

r' = latent heat of evaporation at wet-bulb temperature t'

Knowing any two of the three important values of t, t' or W, it is easy to solve for the third or for any other required relation.

This is an exceedingly useful relationship, not only in air conditioning and the drying of materials, but in the psychrometry of air or other gases to which it directly applies. It is evident that if the wet-bulb temperature of air of a known dry-bulb temperature, but unknown moisture content, be determined experimentally with the wet-bulb thermometer, it is possible to calculate directly the moisture content of that air from the relationship cited.

From this relationship, a psychrometric chart in common use has been evolved. This is most useful in all problems pertaining to air conditioning, drying, and in the determination of the moisture content of air.

A formula has also been derived which will permit the approximate calculation of the vapor pressure from the wet-bulb temperature observation. This is useful particularly in determining relative humidities for conditions other than standard barometric conditions for which the chart is made. The formula for expressing this relationship is:

$$e = e' - (P-e')(t-t')\,2800-1.3t'$$

where

e = partial pressure of the moisture in the air, which also equals vapor pressure corresponding to the dew-point

e' = the vapor pressure corresponding to saturation at wet-bulb temperature t'

P = the barometric pressure

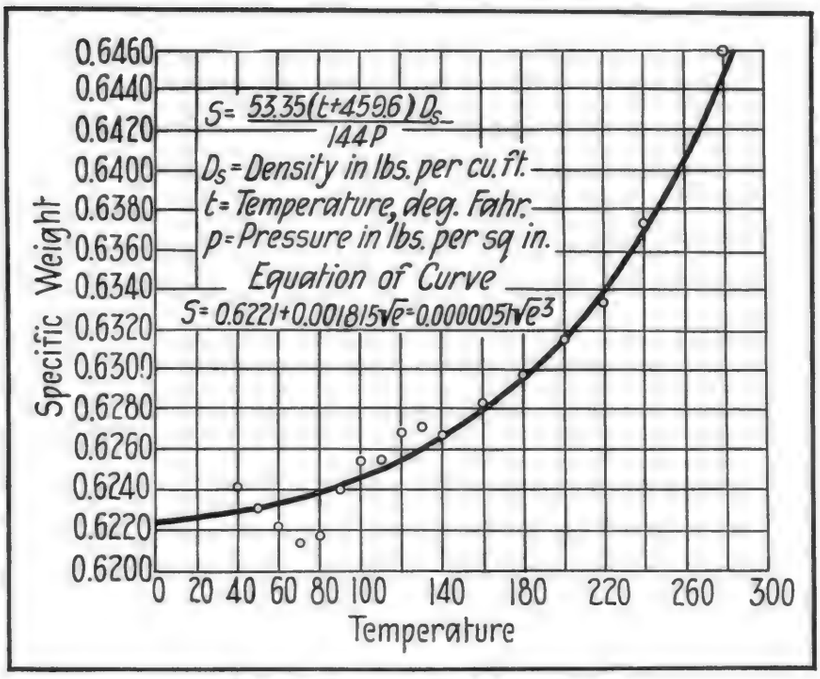
t = dry-bulb temperature in deg. F.

t' = wet-bulb temperature in deg. F.

Total Heat

In cooling and dehumidifying air, it is necessary to take into consideration, not only the sensible heat of the air itself, but the latent heat of the moisture removed.

Air at any temperature and moisture content may be considered as having a certain definite total heat in thermal units per unit weight as calculated from some arbitrary base such as zero moisture and 0° F. temperature. By using the psychrometric chart, on which are given wet-bulb temperatures and corresponding total heats, it is possible to determine the total heat to be removed in the process of dehumidification by subtracting the total heat of the cooled air, with its reduced moisture content, from that of the air in its initial condition as indicated on the chart.



Specific Weights of Water-Vapor

Mr. Carrier's paper divides itself naturally into four sections, the first taking up, in a general way, the air-conditioning requirements of various manufacturing processes; the second, the physical principles of air conditioning; the third, a review of the experimental work at the A. S. H. V. E. Research Laboratory on human comfort and "effective temperatures," and the fourth, modern air-conditioning equipment.

In the accompanying abstract are given some of the physical principles involved. Subsequent issues will contain the balance of Mr. Carrier's discussion of the physical principles and the section on modern air-conditioning equipment.

Control of Humidity and Temperature

by **WILLIS H. CARRIER**
President, Carrier Engineering Corporation

Physical Principles

THE usual requirement in air conditioning as applied to processing hygroscopic materials is to maintain a definite relative humidity. In other instances it is desired to control merely a definite moisture content of the air.

In problems involving human comfort, it is necessary to maintain certain limiting or desirable "effective temperatures" which depend upon the experimentally-determined relationships of wet- and dry-bulb temperatures and air motion. Briefly, those are the requirements in various phases of air conditioning and the terms should properly be defined in order that the following discussion may be clear.

It should be noted first that the moisture content in a given space is independent of the maximum quantity of air or other gases present. In other words, the properties of saturated water-vapor are assumed to be in no way affected by the presence of other gases. Therefore, the quantity of moisture present in a given space may be determined directly from the data available or the physical properties of water-vapor.

As is well known, the vapor pressure of water and, consequently, the weight per unit of volume of that vapor, depends upon its temperature. Vapor pressure and density curves and tables are available for all the ranges of atmospheric temperature, and the accuracy of these can probably be relied upon.

Where the vapor pressure of the water-vapor present is known, it is evident that the proportionate weight of water-vapor to other gases in the mixture obeys Dalton's law, assuming, of course, that they have no chemical affinity. This may be expressed by the relationship:

$$W = \frac{Se}{P-e}$$

where

W = weight of moisture per pound of air.

S = specific weight of water-vapor compared with air as 1.

P = barometric pressure.

e = vapor pressure at temperature t.

If other gases than air are present, then the specific weight of water-vapor must be taken as the density of the water-vapor with reference to the density of the gas at the same pressure and temperature.

The theoretical specific weight of steam, assuming that it obeys the gas laws, would be the ratio of the molecular weight of steam to that of pure dry air. At low temperatures the actual specific weight approaches very closely this theoretical, while at high temperatures the deviation is considerable. The curve of actual specific weights of water-vapor is shown in the illustration.

From this, it is possible to compute with accuracy the weight of water vapor contained in a pound of dry air at any given vapor pressure and barometric pressure.

In a mixture of air and water-vapor, a point is reached where there is a maximum quantity of water-vapor present for any temperature; that is, the air is saturated when the vapor pressure corresponds to the temperature.

Air, however, is usually deficient in water-vapor. That is, it is unsaturated, in which case the vapor pressure is

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From a paper presented at the World Engineering Congress, in Tokio, Japan, November 7, 1929.

lower than the maximum corresponding to the temperature of the mixture. The ratio of such vapor pressure to the vapor pressure of the mixtures when saturated at that temperature is termed the *relative humidity.* That is:

$$\text{Per cent relative humidity} = \frac{e}{e_t}$$

$$= \frac{D}{D_t} \text{ (approximately)}$$

where e and D are the pressure and the density, respectively, of the vapor in the air, and e_t and D_t are the saturation pressure and density, respectively, of the vapor corresponding to the temperature t of the mixture.

Dew Point

If such an unsaturated mixture of air and water-vapor be cooled, without the removal of any moisture present, it will ultimately become saturated. This temperature is termed the *dew point,* for any further cooling will result in a deposition of moisture from the mixture.

Temperature of Evaporation

In the instance cited, the air was saturated by withdrawal of heat and without change in the moisture content.

Air may also be saturated adiabatically, that is, by being brought into contact with the liquid itself and without any addition or subtraction of external energy. Under this condition water vaporizes into the space occupied by the air, and assuming that no heat is available from the water itself. That is, no temperature change takes place in the water present, the heat required for change of state must come from the sensible heat in the air itself, thus resulting in the lowering of its temperature.

The moisture content of the air, therefore, is increased and its temperature lowered simultaneously, and it is obvious that the increase in latent heat must exactly equal the decrease in the sensible heat of the mixture. Further, this process will go on until the air becomes saturated where no further exchange between the sensible and latent heat is possible. This final temperature at which adiabatic saturation takes place in any body of air of known temperature and moisture content is known as the *temperature of evaporation* and corresponds to the *wet-bulb temperature.*

So that no heat exchange may take place between the water and the surrounding air, it is necessary that the water be introduced at this temperature of evaporation. On the other hand, if free water is exposed to a continuous current of air of such a given temperature and moisture content, it will ultimately assume of its own accord this equilibrium temperature of evaporation. This is not only logical, but has been proved experimentally. It is for this reason that an ordinary thermometer which has its bulb covered by a wetted cloth, or otherwise coated with the liquid will, if protected against outside sources of heat such as radiation and subjected to a stream of air having a definite temperature and moisture content, indicate the temperature of adiabatic saturation. This proves the identity between what is termed the *wet-bulb temperature* and the *temperature of adiabatic saturation.*

In the ordinary sling psychrometer, which is used in measuring the moisture content of air, however, there is always some radiation present and, if the wet-bulb be not strongly ventilated, this error may be considerable. With strong ventilation, however, the radiation effect is usually less than 1%.

From the foregoing discussion, four fundamental principles in air conditioning may be evolved:

1. When dry air is saturated adiabatically the temperature is reduced as the absolute humidity is increased, and the decrease of sensible heat is exactly equal to the simultaneous increase in latent heat due to evaporation.

2. As the moisture content of air is increased adiabatically, the temperature is reduced simultaneously until the air is saturated, when no further heat metamorphosis is possible. This ultimate temperature may be termed the temperature of adiabatic saturation.

3. When an insulated body of water is permitted to evaporate freely in the air, it assumes the temperature of adiabatic saturation of that air and is unaffected by convection, i.e., the true wet-bulb temperature of air is identical with its temperature of adiabatic saturation.

4. The true wet-bulb temperature of the air depends entirely on the total of the sensible and the latent heat in the air and is independent of their relative proportions. In other words, the wet-bulb temperature of the air is constant, provided the total heat of the air is constant.

It will be obvious in considering the foregoing process that a formula relating the latent heat change to the sensible heat change establishes the relationship of this theoretical wet-bulb temperature to the temperature and moisture of the air. This was first pointed out in the rational psychrometric formula:[1]

$$r'(W'-W) = C_{pa}(t-t') + C_{ps}W(t-t')$$

in which

$(t-t')$ = the true wet-bulb depression

$(W'-W)$ = moisture absorbed per pound of pure air when it is adiabatically saturated from an initial dry-bulb temperature t_o and an initial moisture content W

C_{pa} = mean specific heat of air at constant pressure between temperature t and t'

C_{ps} = specific heat of steam at constant pressure between t and t'

r' = latent heat of evaporation at wet-bulb temperature t'

Knowing any two of the three important values of t, t' or W, it is easy to solve for the third or for any other required relation.

This is an exceedingly useful relationship, not only in air conditioning and the drying of materials, but in the psychrometry of air or other gases to which it directly applies. It is evident that if the wet-bulb temperature of air of a known dry-bulb temperature, but unknown moisture content, be determined experimentally with the wet-bulb thermometer, it is possible to calculate directly the moisture content of that air from the relationship cited.

From this relationship, a psychrometric chart in common use has been evolved. This is most useful in all problems pertaining to air conditioning, drying, and in the determination of the moisture content of air.

A formula has also been derived which will permit the approximate calculation of the vapor pressure from the wet-bulb temperature observation. This is useful particularly in determining relative humidities for conditions other than standard barometric conditions for which the chart is made. The formula for expressing this relationship is:

$$e = e' - (P-e')\ (t-t')\ 2800-1.3t'$$

where

e = partial pressure of the moisture in the air, which also equals vapor pressure corresponding to the dew-point

e' = the vapor pressure corresponding to saturation at wet-bulb temperature t'

P = the barometric pressure

t = dry-bulb temperature in deg. F.

t' = wet-bulb temperature in deg. F.

Total Heat

In cooling and dehumidifying air, it is necessary to take into consideration, not only the sensible heat of the air itself, but the latent heat of the moisture removed.

Air at any temperature and moisture content may be considered as having a certain definite total heat in thermal units per unit weight as calculated from some arbitrary base such as zero moisture and 0° F. temperature. By using the psychrometric chart, on which are given wet-bulb temperatures and corresponding total heats, it is possible to determine the total heat to be removed in the process of dehumidification by subtracting the total heat of the cooled air, with its reduced moisture content, from that of the air in its initial condition as indicated on the chart.

This process is greatly simplified by taking into account the fourth psychrometric principle; in other words, in observing the fact that the wet-bulb temperature of the air may be used as the measure of the total heat which the air contains.

Thus, having given air of known temperature and known moisture content, a corresponding wet-bulb temperature is obtained. Then, under standard barometric conditions, the quantity desired is determined by reference to the curve of total heat.

For example, air at 85½° F. with 80% relative humidity has exactly the same total heat as air at 101° F. and 40% relative humidity, because in both cases the wet-bulb temperature is 80° F. This wet-bulb temperature represents about the maximum wet-bulb temperature ever encountered in the temperate zones under extreme conditions, and is nearly the maximum found in the tropics. A normal high wet-bulb temperature for the temperate zone may be taken at 75° F. in calculating requirements for air cooling, as this is seldom exceeded except for short periods.

In the balance of his discussion of the physical principles of air conditioning, which will be presented in next month's issue, Mr. Carrier discusses the relation of dew-point to relative humidity and rate of evaporation.

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[1]Rational Psychrometric Formula, Trans. A.S.M.E., Vol. 33, 1911.

Board of Trade for New York Heating Industry

ALARMED by conditions existing in the heating and ventilating industry in the metropolitan district, a mass meeting of representatives of manufacturers, jobbers, engineers and contractors was held October 7, under the auspices of the Heating and Piping Contractors New York City Association, to devise ways and means of meeting the situation. As a result of the discussions, it was voted to organize a Heating Board of Trade for the metropolitan district, which will include all the elements going to make up the heating and ventilating industry in that section. A tentative organization was formed and a committee on organization appointed with instructions to report at a subsequent meeting to be held, if possible, before November 1.

R. A. Wolff, of the contracting firm of Wolff & Munier, was elected temporary chairman, and William E. Taylor, executive secretary of the Heating and Piping Contractors New York City Association, was named temporary secretary. Subsequent to the meeting, Chairman R. A. Wolff appointed the following as a committee on organization:

P. R. Mork, chairman, Crane Co., manufacturers and jobbers.
B. W. Bennett, Charles Hartmann Co., sheet metal contractors.
L. K. Berman, Raisler Heating Co,. heating contractors.
Harry N. Booth, U. S. Radiator Corp., manufacturers of cast-iron boilers and radiators.
Sam Carrier, Heggie-Simplex Boiler Co., manufacturers of steel boilers.
John G. Eadie, Eadie, Freund and Campbell, consulting engineers.
J. D. Erskine, Rome Brass Radiator Corp., manufacturers of brass radiators.
W. L. Fleisher, consulting engineer.
Milton Goldsmith, Samuel S. Glauber, Inc., jobbers.
A. P. Keasbey, R. A. Keasbey Co., covering contractors.
Charles E. Lawrence, Massachusetts Blower Co., fan manufacturers.
William Le Compte, Jenkins Bros., valve manufacturers.
John Ney, American Radiator Co., manufacturers of cast-iron radiators and boilers.
Werner Nygren, consulting engineer.
John E. Rutzler, E. Rutzler Co., heating contractors.

Nearly 100 representatives of the industry responded to the call issued by the Heating and Piping Contractors New York City Association to attend the meeting, which was held at the Building Trades Club, 2 Park Avenue. President Robert B. Miller of the Heating and Piping Contractors New York City Association presided and called upon Executive Secretary William E. Taylor to explain the purpose of the meeting.

"The heating industry," declared Mr. Taylor, "is suffering from lack of organized control. Too frequently the interests of the individual units in the industry cross each other. Individual acts of these units have had the effect of leading the industry down hill, rather than up, so that it is not too much to say that the industry today, in the metropolitan section, at least, is in the slough of despond.

"Bad practices," said Mr. Taylor, "come about as a result of individual action. We need to coordinate the individual units to obviate this condition. We are dealing with big business. In 1928, the value of the heating and ventilating equipment installed in the metropolitan district amounted to $60,000,000. Two-thirds of this amount is represented in the purchase of materials, constituting an item of $40,000,000 in manufacturers' supplies.

"It is necessary to join hands and to create an organization for developing facts with reference to the industry. Too long has the industry lived in an atmosphere of inheritance, gauging its activities by those of a previous generation. Too long has it been customary for one or more groups to consider that they represent the heating and ventilating industry.

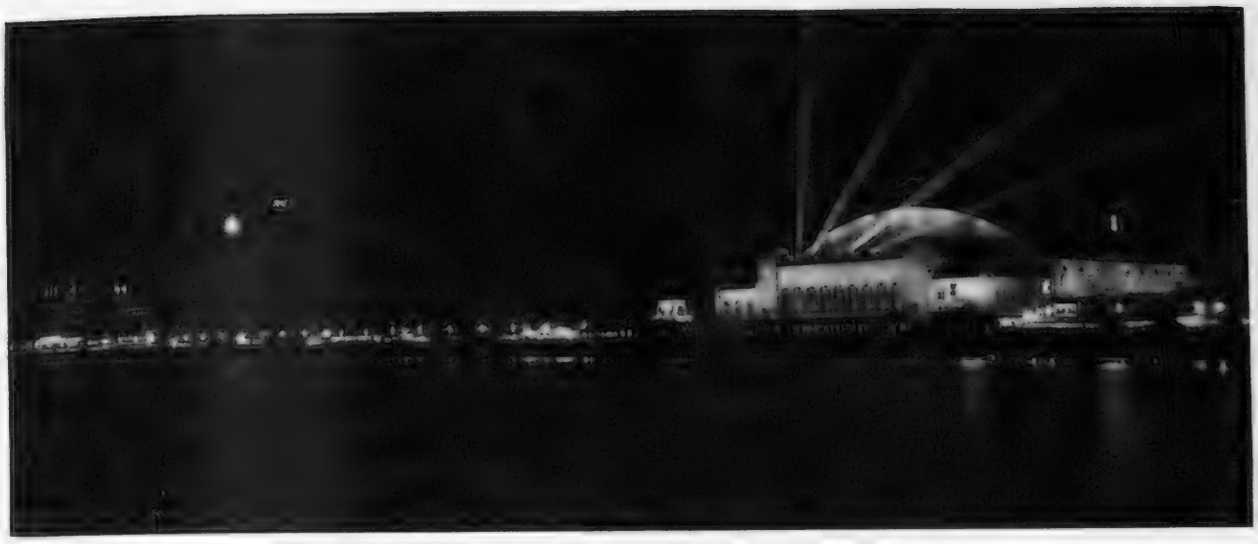
"What is needed," declared Mr. Taylor, "is a heating board of trade, where each group will be represented on the board of directors and have one vote. The executive committee should be composed of one member of each group together with the officers. In this way, the industry can achieve concentration and centralization. The character of the business is changing so completely that within the next decade the usefulness for such an organization will plainly be manifest."

Mr. Taylor attributed much of the present troubles to the fact that the manufacturers required an outlet for their surplus products. "In some cases," he said, "attempts had been made to revamp the heating contractor and to make him a merchandiser. They soon discovered, however, that they could not do this except in individual instances. Manufacturers as a class, have considered the marketing of their products as their own problem. However, this is not alone a manufacturer's problem and the heating contractor must take part in its solution."

R. A. Wolff, of Wolff & Munier, said, "We know things are not right in the industry and we know that an organization is needed, representing all the elements that go to make up the industry. So far as I know, no meeting of this kind has ever been held before." Other speakers who endorsed the proposition were E. F. Keating, of the E. F. Keating Company, Clyde R. Place, consulting engineer, and William G. Le Compte, of Jenkins Bros.

A resolution that the meeting endorse the movement to organize a "Heating Board of Trade" was adopted unanimously.

On taking the chair, R. A. Wolff, the temporary chairman, expressed his determination to do his best toward giving effect to the action of the meeting. A resolution then was offered and unanimously adopted that the chairman be authorized to appoint a committee on organization to be made up of ten or fifteen members and to report at a subsequent meeting to be held prior to November 1, 1929.



Municipal Auditorium, At the Right, in Atlantic City, N. J.

Automatic Heat with Gas Feature of A. G. A. Convention

PAPERS urging the necessity for greater cooperation between heating contractors and gas companies, the ever-growing interest in house-heating, and the exhibits of house-heating equipment and related products were prominent features of the 11th annual convention of the American Gas Association, held at the Municipal Auditorium, Atlantic City, October 14-18.

Over 400 attended the first meeting of the commercial section, held Tuesday afternoon, October 15. The committee room was crowded, many members being forced to stand, and others were unable to gain admittance. Two of the outstanding papers at this session were those on "Results from Cooperative Merchandise Activities and Suggestions for Further Developments," by A. J. Peters, of the Consolidated Gas Company of New York, and E. R. Acker, of the Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y. Mr. Peters' paper is presented in full on page 89. Mr. Acker stated in his paper that:

"As the result of a complete five-year forecast of business available in the territory of the company which I represent, we have adopted cooperative selling in both our gas and electric departments. The activity is further advanced in the gas department than in the electric for the reason that we have found the heating and plumbing dealers more willing to cooperate and generally better equipped to cooperate than the electrical contractor. We have announced to our electrical leagues and to our heating and plumbing dealers that *we are looking forward to the time when the bulk of the merchandising done in our territory will be done by dealers.*

"We have stated that the change will not be made over night, but will be made as rapidly as their own organizations can be built up and the volume of business increased by the group as a whole. We also have stated that as soon as practicable our salesmen will be changed from the status of salesmen to that of sales stimulators, each one being assigned a certain number of dealers and paid on a load building basis for the business produced by his particular group.

"This is merely a repetition of the idea of group merchandising, or mass merchandising, already adopted in many industries. It means an immediate increase in the number of sales outlets, in the total selling effort, and in the advertising and publicity effort put forth. It means an immediate reduction of the sales resistance through the elimination of uneconomic competition and an improved position for the group as a whole from a purchasing standpoint.

"Justification for a group merchandising activity is, as I have said, purely economic—that it will produce the greatest volume of business for the group. In doing so it is only good if it works to the advantage of the customer. I feel, without question, that the customers' interests are advanced by producing the largest volume of sales possible, so that prices and costs can be reduced and so a larger service rendered the community.

"If it is granted that we must seek the means to produce the largest volume of business, it is obvious that the activity cannot be confined to some *particular* group of dealers, unless the technical nature of the merchandise sale or installation is such that it cannot be handled by dealers generally. The dealers must be selected who will produce the business, *wherever* they are.

"In our gas merchandising it has been logical to confine our cooperative activities to heating and plumbing dealers. In our electrical merchandising, however, the activity has been extended to many kinds of dealers, in addition to electrical contractors. In small outlying communities we have general stores selling electric ranges and electric refrigerators. In one outstanding case, in a very small community, we have a grocer as a dealer, selling about ten electric ranges each month. This has been a difficult pill for the electrical contractor to swallow. We have insisted, however, that the best condition for the electrical industry, its collateral trades, and for the customer, is when the largest volume of business is done at a profit, and our contractors have agreed with us that they will actually benefit through any activity which increases the use of electricity by our customers.

"We are agreed that the combination of individual effort and combined effort

A View from the Front Balcony of the Municipal Auditorium, Showing the Exhibits at the A. G. A. Convention

will result in improving both the general market and the individual market.

"Group merchandising contemplates the sale of *one product* by the entire group and it is probably more difficult for the dealer to agree to this principle than any other. He feels that it is of just as much value to the company to have him attach one make of appliance to our lines as another. He loses sight of the fact that while the revenue produced by an individual range is the same in either case, the only reason for group merchandising is that it will produce greater total sales. It will produce greater total sales, first, because through combined purchasing the cost can be decreased and therefore either the price to the customer decreased or greater sales effort put forward; and, second, because the entire group will advertise, talk and sell one particular appliance, thus broadening the market and reducing sales resistance and unproductive competition between the dealers.

All Dealers Must Sell Same Make Appliances

"As soon as one dealer departs from one of the fundamental reasons for the cooperative method of selling, his efforts actually become less valuable to the company and in the end to the customer, than the effort of the dealer who cooperates in full. We have consistently maintained the principle, therefore, that the entire group must cooperate in the sale of the same article or group of articles. Our salesmen, who not only sell merchandise directly to the customer but also stimulate dealer sales, are only paid a load building commission on the merchandise sales of cooperating dealers who sell the same article of merchandise which the company sells.

"We recognize, however, that the sales of appliances by dealers can never be confined entirely to one make. We expect to develop a plan by which some assistance can be given by the company to such dealers as wish to sell other makes of appliances. It is obvious that this assistance cannot be as great as that rendered the dealer who enters into the cooperative selling plan.

"Essentials of the cooperative selling plan which we have developed to date with gas and electric dealers in our territory, are as follows:

"The company supplies certain appliances to the cooperating dealers at prices at least as low and in most cases lower than he would be able to purchase them at himself. The company maintains a stock of appliances in its warehouse so that it is not necessary for the dealer to tie his money up in stock. The company finances the time payment accounts of the contractor dealer, paying the contractor at that time of the sale the retail cash price, less 1½% to cover the cost of accounting and carrying the credit risk. The contractor is relieved of the credit risk entirely as soon as the sales contract is assigned to the company.

"'Ask Your Own Plumber' is the slogan carried by the company in all of its gas merchandise advertising. Also, the company carries on group advertising with the dealers and shares the expense with them.

"However, the factor that vitalizes the plan is the coordination of the company's salesmen with the dealer group. I have said that we have announced to our dealers that we are looking forward to the time when our salesmen will not merchandise directly but will produce sales only through the stimulation of dealers. In our gas merchandising business we hope to reach this position during the coming year.

"In 1928, the first year of our cooperative water heater selling plan with our plumbers, 18% of the total storage water heaters sold were merchandised through the heating and plumbing dealers. In 1929, approximately 80% of the storage water heater sales will be through plumber dealers, so that some time during the year 1930, we should find it possible to discontinue direct selling entirely."

"Sales Progress in House-Heating" was discussed by A. C. Johns, of the Peoples Gas Light & Coke Co., Chicago. Mr. Johns, who can always be expected to deliver an able paper on house-heating, pointed out that there has been a 40% increase in house-heating with manufactured gas and a 38% increase in house-heating with natural gas during the past year, and that 3.7% of the gas sold is used for house-heating.

Methods employed by the Peoples Gas Light & Coke Company to overcome the sales resistance to gas-fired house-heating installations were described by Mr. Johns. He stated that in going over past records it was found that in the water-heater field a 60-day free trial of a low-priced heater had stimulated sales some years ago. While it was not possible to carry out this idea with house-heating equipment, the general idea was used and conversion burners are now being rented by this company for $5 a month, plus an installation charge ranging from $25 to $65, the owner being advised that if he purchases the burner before the end of the first year, his rental charges will be deducted from the burner cost.

These installations have more than doubled since the campaign was started in July, and 10% of the Peoples Gas Light & Coke Company heating installations are now conversions, while one year ago this percentage was 3%.

B. J. Mullaney, vice-president of the Peoples Light & Coke Company, who was elected president of the American Gas Association for the coming year, attended the first commercial session, and stated that in all his experience he had never seen a meeting that looked "more like business" than the one in which house-heating was discussed.

Paul D. Close, technical secretary of the American Society of Heating and Ventilating Engineers, presented a paper on "Importance of Insulation in the Future Development of House-Heating." Mr. Close was introduced by the chairman of the commercial section, G. M. Karshner, Consolidated Gas Company of New York, as an authority on insulation, and his paper proved Mr. Karshner correct in his statement. The paper discussed the various types of insulation, the saving of fuel possible, and the economics of insulation.

Oscar H. Fogg, president of the association and vice-president of the Consolidated Gas Company of New York, in his opening remarks at the first general session, Tuesday, October 15, read telegrams of good will from the German Gas Association, the Swiss Gas Association, the British Gas Association, and several American members not present, among whom was Henry L. Doherty.

Encouraging Increase in House-Heating

In his report, "The Industry's Program," Alexander Forward, managing director of the association, said that progress is being made in house cooling, which is in the hands of competent technically-trained men. Progress also is being made in promoting cooperation with associations of heating and plumbing contractors, heating and ventilating engineers, etc. Mr. Forward stated that in the first eight months of 1929, as compared with the same period in 1928, there had been a 9.3% increase in gas output, due chiefly to the increase in house-heating. Some companies show an increase in output as high as 20% due to the addition of house-heating loads.

B. J. Mullaney, vice-president of the Peoples Gas Light & Coke Company, was elected president of the association, and will succeed Oscar H. Fogg, of New York, who has completed a two-year term. Clifford E. Paige, of Brooklyn, vice-president of the Brooklyn Union Gas Company, was elected vice-president. William J. Wells, president and general manager of the New York and Richmond Gas Company, was elected treasurer.

The commercial section of the association elected George E. Whitwell, of the Equitable Gas Co., Pittsburgh, chairman, and E. R. Acker, of the Central Hudson Gas and Electric Corp., Poughkeepsie, as vice-chairman.

Samuel W. Meals, of Pittsburgh, president of the Carnegie Natural Gas Cor-

poration, said that "the development of the gas industry in America will be little short of spectacular, because of the rapid strides being made in the industrial and house-heating fields."

At the second commercial session, Wednesday, October 16, John A. Quinn, president of the National Association of Master Plumbers, was invited to speak. Mr. Quinn said that, speaking as a representative of his organization, every member would be willing to cooperate with the gas utilities in merchandising their equipment, provided they could make a fair profit on the business. The sentiment of the convention as a whole, seemed to indicate that the future looks bright for increased cooperation between the gas companies and the heating and plumbing contractors.

Speaking before the manufacturers' session, Monday, October 14, Edwin W. Ely, chief of the Division of Simplified Practice, Bureau of Standards, United States Department of Commerce, recommended standardization and simplification as economic forces for the further development of the gas industry. He stated that "the successful production, distribution and use of electric and gas appliances depend upon reasonable costs, ease of installation, simplicity of upkeep, ready interchangeability, and quick replacement of parts."

The same afternoon, Oscar H. Fogg, president of the association, stated that the industry had gained 500,000 customers in 1928, and had 16,000,000 at the end of the year; that it represented investments of $4,750,000,000. He further said: "One of the outstanding features of the development of gas usage in the manufactured gas industry was that of the increase of 40% in house-heating sales and an 8% increase in industrial and commercial sales."

A prediction that the day would come when gas would serve every domestic, commercial and industrial need for heat and elimination of the smoke nuisance, was made by Philip Cabot, of the Harvard School of Business Administration, in an address Thursday afternoon, October 17. He added, "Coal still occupies the largest place in the heating field, but the day when raw coal should be burned for domestic or industrial purposes in cities, or even in suburban areas, has passed. The smoke and dirt resulting from this practice not only render our cities less attractive to live in, but are probably a distinct menace to our health. Raw coal must be driven from the field and you must do it."

Through amplifiers in the main hall in the Municipal Auditorium, Sir David Milne Watson, managing director of the Gas, Light and Coke Company of London, made a ten-minute speech to the convention by transatlantic telephone, Wednesday morning, October 16. He complimented the industry in America on the progress it had made and referred to the visit of Prime Minister MacDonald as an agency of good-will and mutual understanding between the two nations.

Of the 263 organizations exhibiting, 48 displayed house-heating equipment in the form of boilers, furnaces, conversion units, controls and insulation. These were as follows:

American Foundry & Furnace Co.,	Bloomington, Ill.	American gas furnace.
American Gas Products Corp.,	New York.	Ideal gas boilers "A.G.P." Gas-fired steam vented and unvented radiators. "A.G.P." warm-air gas radiator. Rochester gas furnace, Time-O-Stat controls.
American Radiator Co.,	New York.	Gas-fired boilers, gas steam radiators, space heaters.
Armstrong Cork & Insulation Co.,	Lancaster, Pa.	Insulating materials, Armstrong's corkboard, Armstrong's and Nonpareil insulating brick, Nonpareil high-pressure blocks.
Autogas Corp.,	Chicago, Ill.	Autogas conversion burner.
Automatic Gas Steam Radiator Co.,	Pittsburgh, Pa.	Gas steam radiators.
B-Line Boiler Co.,	Cleveland, O.	Automatic gas heating boilers and accessories.
Bristol Co.,	Waterbury, Conn.	Instruments for recording, indicating and controlling pressure, temperature, motion, speed, etc.
Bryan Steam Corp.,	Peru, Ind.	Gas-fired house-heating boilers.
Bryant Heater & Mfg. Co.,	Cleveland, O.	Gas house-heaters.
A. M. Byers Co.,	Pittsburgh, Pa.	Wrought-iron pipe.
Carrier-Lyle Corp.,	New York.	Carrier Weathermaker.
Celotex Co.,	Chicago, Ill.	Model of house showing Celotex used in construction.
Cleveland Gas Burner & Appliance Co.,	Cleveland, O.	Barber patented jet gas burners.
James B. Clow & Sons,	Chicago, Ill.	Gasteam radiators.
Collier Gas Heating Co.,	Lynn, Mass.	Gas-fired boiler, Collier heating elements.
Columbia Burner Co.,	Toledo, O.	Gas conversion burners.
Columbus Heating & Ventilating Co.,	Columbus, O.	Gas-fired warm-air furnace.
Crane Co.,	Chicago, Ill.	Valve and fitting industrial exhibit and Basmor gas-fired boiler.
Foxboro Co.,	Foxboro, Mass.	Indicating, recording and controlling instruments.
Gas Heat Corp.,	New York.	Gas-fired furnace and boiler.
General Gas Light Co.,	Kalamazoo, Mich.	Radiantfires and industrial unit heaters.
General Iron Works Co.,	Cincinnati, O.	Hot-Kold gas warm-air heater and air conditioner.
Heating and Ventilating,	New York.	Publications.
Johns-Manville, Inc.,	New York.	Insulating materials.
Kieley & Mueller, Inc.,	New York.	Pressure regulating valves.
McDonnell & Miller,	Chicago, Ill.	McDonnell No. 30 safety feeder.
Mettler Co., Lee B.	Los Angeles, Calif.	Mettler gas burners.
Minneapolis Honeywell Regulator Co.,	Minneapolis, Minn.	Complete line of temperature controls.
Minwool Insulating Co. of N.E.,	Boston, Mass.	Therminsul insulation.
L. J. Mueller Furnace Co.,	Milwaukee, Wis.	Gasera furnaces and boilers.
Peerless Heater Co.,	Boyerstown, Pa.	Super section gas boilers.
Pennsylvania Furnace & Iron Co.,	Warren, Pa.	Gas furnace, floor heater.
F. I. Raymond Co.,	Chicago, Ill.	Weather compensating heat regulating instruments.
Richmond Radiator Co.,	Philadelphia, Pa.	Gas boilers.
Roberts-Gordon Appliance Corp.,	Buffalo, N. Y.	Roberts controlled gas heating units and duplex heating system.
Robertshaw Thermostat Co.,	Youngwood, Pa.	Thermostats.
Rudy Furnace Co.,	Dowagiac, Mich.	Gas furnace.
Spencer Thermostat Co.,	Cambridge, Mass.	Safety pilots, thermostats, gas controls.
Stat-a-Matic Instrument & Appliance Co.,	Hartford, Conn.	Automatic temperature control for gas fired boilers.
Staynew Filter Corp.,	Rochester, N. Y.	Protectomotor air filters.
Steinhorst & Sons, Inc., Emil,	Utica, N. Y.	Steinhorst gas-fired warm-air furnace.
Surface Combustion Co.,	Toledo, O.	Surface combustion gas conversion units.
Sweet & Doyle Foundry & Mch. Co.,	Troy, N. Y.	Gas conversions.
Time-O-Stat Controls Co.,	Elkhart, Ind.	Automatic controls for gas-fired equipment.
United States Bureau of Mines,	Washington, D. C.	Publications.
United States Bureau of Standards, Dept. of Commerce,	Washington, D. C.	Publications.
Warm Air Furnace Fan Co.,	Cleveland, O.	Miles automatic furnace fan, Reed furnace filter.
Watts Regulator Co.,	Lawrence, Mass.	Relief valves, reducing valves, hot water heating system controls.

Importance of Insulation in Future Development of Gas House-Heating

by **PAUL D. CLOSE**
Technical Secretary, A. S. H. V. E.

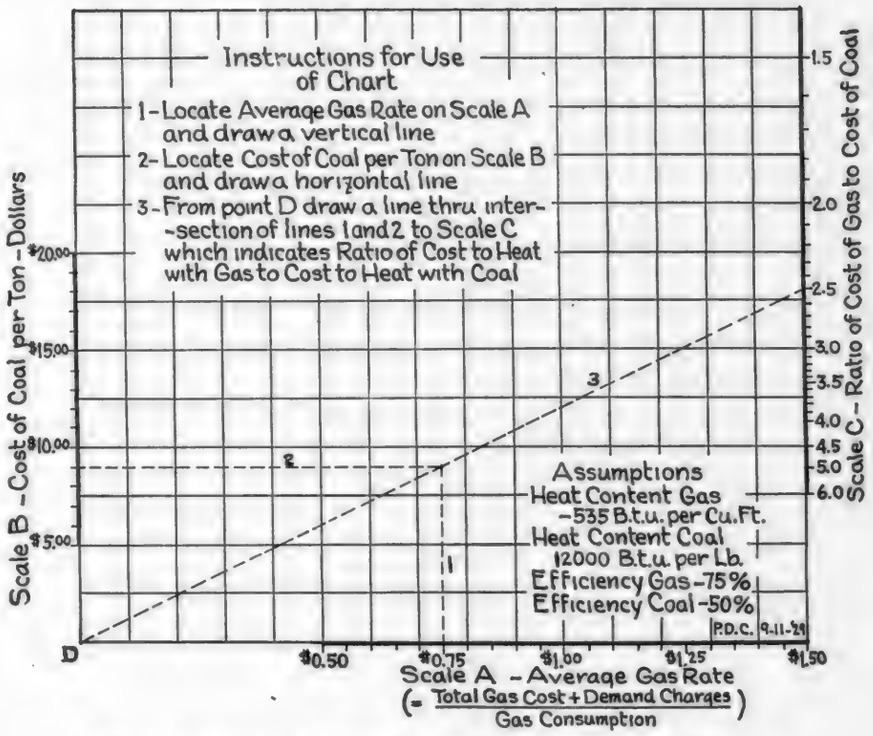

Instructions for Use of Chart
1-Locate Average Gas Rate on Scale A and draw a vertical line
2-Locate Cost of Coal per Ton on Scale B and draw a horizontal line
3-From point D draw a line thru intersection of lines 1 and 2 to Scale C which indicates Ratio of Cost to Heat with Gas to Cost to Heat with Coal
Scale B - Cost of Coal per Ton - Dollars
$20.00
$15.00
$10.00
$5.00
Scale C - Ratio of Cost of Gas to Cost of Coal
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
6.0
Assumptions
Heat Content Gas -535 B.t.u. per Cu.Ft.
Heat Content Coal 12000 B.t.u. per Lb.
Efficiency Gas-75%
Efficiency Coal-50%
P.D.C. 9-11-29
D
$0.50
$0.75
$1.00
$1.25
$1.50
Scale A - Average Gas Rate
(= Total Gas Cost + Demand Charges / Gas Consumption)

Fig. 1. Chart for Estimating Comparative Cost of Gas and Coal

IN order to place gas on a competitive basis with other fuels for house-heating purposes, the questions arise as to how much and what type of insulation should be used and how and where it should be applied. From a theoretical point of view, the answer is comparatively simple, for it is only necessary to reduce the heat losses of the building sufficiently so that the heating costs with gas are no more than with coal or oil for the uninsulated building. Practically, however, the problem is not always quite as simple as this, but the ideal can usually be approached if not attained, even where manufactured gas is used.

Suppose, for example, the cost of coal having a heat content of 12,000 B.T.U. per lb. in a certain locality is $10 per ton and that it is burned with an efficiency of 50%. If the average gas rate is $1 per thousand for 535 B.T.U. gas, and the overall efficiency of combustion is 75%, the cost of gas is three times that of coal, and hence the heat losses of the gas-heated building must be one third that of the coal-heated building in order that fuel costs are on the same basis. By the average gas rate is meant the total costs of gas per heating season for an average insulated residence, divided by the quantity of gas used. This, of course, takes into consideration the demand charges.

The heat losses of a building take place in three ways: (1) by transmission through the walls and roof, (2) by transmission through glass, and (3) by exfiltration through cracks, crevices, etc. While the proportion of the heat losses varies with every building, the average is approximately 50% through walls and roof, 25% through glass and 25% by exfiltration.

Abstracted from a paper presented before the Commercial Section at the American Gas Association, Atlantic City, Oct. 14-18, 1929.

In this example just cited, it would, of course, be necessary to reduce all of the three sources of heat loss to the same degree, that is, to one third the original heat loss, in order to heat with gas at the same cost as with coal. If one of the sources of heat loss cannot be reduced to this extent, the balance must be made up by reducing one or both of the other sources of heat loss to a greater extent than two-thirds. Herein lies one of the difficulties of attaining the ideal condition desired for gas heating.

Since the cost of coal as well as the gas rate varies in each city, a chart for estimating the ratio of the cost of gas as a fuel to the cost of coal for various gas rates and coal costs, would be useful in some cases. Such a chart (Fig. 1) is based on efficiencies of 75% and 50% respectively for gas and coal.

If each building were carefully analyzed to determine the extent to which the heat losses should be reduced in order to heat it with gas at no greater cost than with coal or oil, various thicknesses of insulation would of course be required. For example, in one case 5 in. of a certain type of insulation might be necessary, in another case 3 in., and in still another only 1 in. But these thicknesses would not necessarily be the economic thickness for gas fuel at the prevailing local commodity and demand rates, and hence, to be theoretically correct, the calculations should be carried a step further to make sure that the proper economic thickness is selected.

These calculations, however, would become somewhat complicated and involved. Furthermore, in many cases the thickness required could not readily be adapted to the type of construction to be used, for an odd thickness of insulation frequently cannot be installed in standard construction without considerable extra expense.

What is the solution? The answer is that as a rule the detailed calculations necessary to determine the correct thickness of insulation to use are usually unnecessary. The heat losses of a building are in most cases reduced sufficiently by installing weatherstripping and storm sash and a type and thickness of insulation which can be readily applied and is consistent with the cost of fuel, geographical location, etc.; in other words, a thickness sufficient to result in an appreciable reduction in the heat losses through the walls and roof and which

will pay a reasonable return on the money expended for it. The heat losses of a building thus insulated will usually be reduced sufficiently, and the cost of heating the insulated building will be no greater with gas than the uninsulated building with less expensive fuels.

It is possible to reduce the heat losses of a building one-half to two-thirds by the use of storm windows, good weatherstripping and a sufficient thickness of insulation. In fact, in extreme cases the heat losses can be reduced to an even greater extent. This is especially true with a poorly constructed building where the average heat losses for a building of the size and type involved are greatly exceeded.

While it is true that in the majority of cases the use of a substantial thickness of insulation is warranted when gas is to be used as a fuel, generalities are likely to be misleading when applied to the subject of the economic value of insulation. An accurate analysis of any installation should take into consideration the uninsulated and insulated constructions, the cost of the insulation, climatic conditions, cost of fuel, efficiency of combustion and utility, and other factors. Hence, each problem involving the economic value of insulation should be carefully analyzed on the basis of the conditions involved.

Consider a residence to be located in the vicinity of New York which is to be heated with gas. The question arises as to the propriety of insulating this building. Assume that it was originally intended to use frame walls without insulation, consisting of wood siding, building paper, wood sheathing, studding, wood lath and plaster. The gas company recommends that the walls be insulated in order to reduce the gas consumption to a desirable minimum, and the owner decides upon a construction for the walls consisting of a rock wool fill between the studding, 1 in. board insulation for sheathing and ½ in. board insulation for plaster base. In this particular case, the additional cost of the insulation is approximately $230 per 1000 sq. ft. of net wall area. The saving in cubic feet of manufactured gas having a heat content of 535 B.T.U. per cu. ft., can be determined from the following formula, which is based on an overall efficiency of 75%:

$$Fg = 0.06\ (U - U_i)\ DA$$

where

U = Coefficient of transmission of uninsulated wall (or roof)

U_i = Coefficient of transmission of insulated wall (or roof)

D = Degree-days

A = Net wall (or roof) area, sq. ft.

The average number of degree-days for New York is 5300 and for 1000 sq. ft. of wall area, the annual fuel saving Fg will be

$$0.06 \times (0.262 - 0.54) \times 5300 \times 1000 = 66{,}100 \text{ cu. ft.}$$

If the average gas rate is $1 per MCF, this fuel saving will have a monetary value of $66.10, and the return on the investment will be

$$\frac{\$66.10}{\$230.00} \times 100 = 29\%$$

For these conditions, the use of insulation is therefore well justified, notwithstanding the fact that no consideration has been given to the reduction in the required amount of radiation and the corresponding reduction in the size of gas boiler. The saving in steam radiation Rs can be estimated from the following formula:

$$Rs = \frac{(U - U_i) \times Hm \times A}{240}$$

where

Hm = the maximum heat head or temperature difference.

The design temperature difference Hm used in this case is assumed to be 70° and the radiation saving for 1000 sq. ft. of net wall area will therefore be

$$\frac{(0.262 - 0.054) \times 70 \times 1000}{240} = 60.6 \text{ sq. ft.}$$

If the allowance for the reduction in radiation is $1 per sq. ft., a saving of $60.60 per 1000 sq. ft. of wall area insulated is obtained, and if this sum is deducted from the cost of the insulation, the net cost of the insulation will be $169.40. The return on the investment resulting from the fuel saving will then be

$$100 \times \frac{\$66.10}{\$169.40} = 39\%$$

In many cases the saving in radiation will permit the use of a smaller size boiler, and this saving should of course be credited to the insulation. If a hot water system is installed, the saving in radiation will be even greater than in the foregoing analysis. Under certain conditions the saving in radiation and the use of a smaller capacity boiler will pay for the insulation. In fact, in some cases the saving in radiation may alone be sufficient to pay for the insulation.

Where warm-air systems are used the reduction in the size of the physical equipment is not usually an appreciable item, especially where conversion burners are used. The value of the insulation is reflected primarily in the fuel saving.

In the problem just cited certain minor factors were neglected. These include the possible change in the demand or commodity rates resulting from the decreased fuel consumption and radiation installed, interest and depreciation, exposure factors, etc. However, the figures are sufficiently accurate to prove conclusively that the use of the insulated construction contemplated is well warranted.

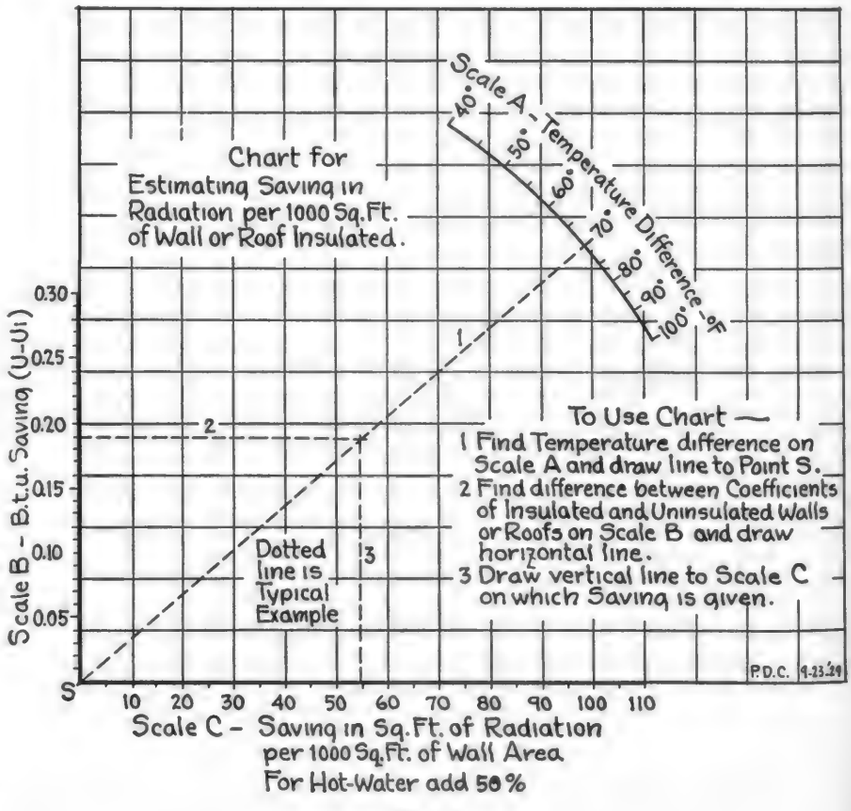


Chart for
Estimating Saving in
Radiation per 1000 Sq.Ft.
of Wall or Roof Insulated.
Scale A - Temperature Difference - °F
40°
50°
60°
70°
80°
90°
100°
Scale B - B.t.u. Saving (U-Ui)
0.30
0.25
0.20
0.15
0.10
0.05
S
1
2
3
Dotted line is Typical Example
To Use Chart —
1 Find Temperature difference on Scale A and draw line to Point S.
2 Find difference between Coefficients of Insulated and Uninsulated Walls or Roofs on Scale B and draw horizontal line.
3 Draw vertical line to Scale C on which Saving is given.
P.D.C. 9-23-29
10 20 30 40 50 60 70 80 90 100 110
Scale C - Saving in Sq.Ft. of Radiation per 1000 Sq.Ft. of Wall Area
For Hot-Water add 50%

Fig. 2

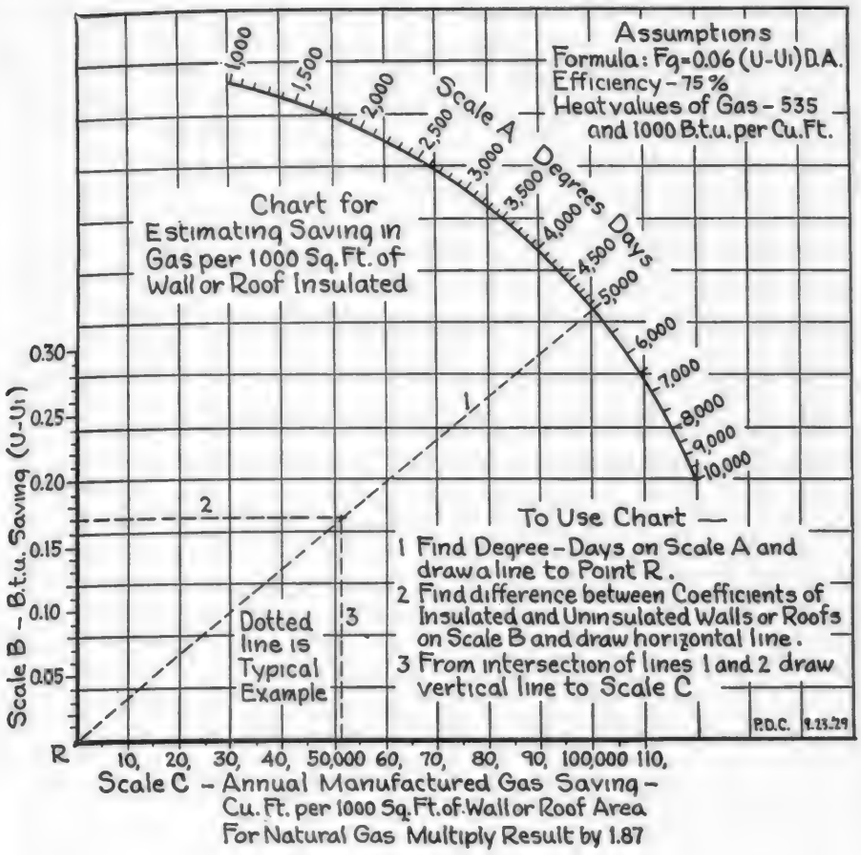


Fig. 3

an even greater reduction in the heat loss is usually advisable where gas fuel is to be used, provided the cost of the insulation is not excessive.

Application of insulation to a wall follows the law of diminishing returns. In other words, if a material is susceptible of application in successive thicknesses; each thickness will reduce the heat loss to a lesser degree than the preceding one, and if the cost of each be the same, the value of each thickness added will be less and less until a point is reached where no further additions of insulation are warranted because of the small return. This, in a measure, explains why Wall B pays a greater return than the other types of wall shown when used in place of Wall A—that is, because a lesser thickness of insulation is involved and therefore a greater return on the money expended is obtained.

It would not be difficult to estimate the exact optimum thickness of insulation for every problem, but it is doubtful if this degree of refinement is warranted, especially when there are so many variables of questionable magnitude involved. As previously stated, it is usually sufficient to select a type and thickness of insulation consistent with the cost of the fuel, and one which can be readily applied to standard construc-

Insulations are commonly classified as:

1. Rigid or board insulations.
2. Flexible insulations.
3. Fills.
4. Corkboard.

In the selection of any type or thickness of insulation, care should be exercised to avoid the necessity of special trim and window frames, as these items might be sufficient to make the cost of the insulated construction prohibitive.

Several types of standard insulated frame construction, involving the use of all four classes of insulation, are shown in Table 2. Data pertaining to the economic value of the insulation, based on the same assumptions as were used in the problems previously discussed, are given in Table 1. If Wall B is used in place of Wall A, the estimated return on the investment based on the fuel saving is 57%, whereas if the radiation saving is also taken into consideration, the insulation will be paid for in less than one heating season. For Wall C, the estimated returns are 30% and 42%; for Wall D, 29% and 39%; for Wall E, 34% and 50%, and for Wall F, 39% and 60%. While Wall B shows the largest return for the money expended for insulation, it does not necessarily follow that this type of wall is superior to the others considered, for the assumptions used. In fact, although the heat loss through the wall is reduced 48% by substituting Wall B for Wall A,

Table 1. Table Showing Estimated Return on Investment for Insulated Walls when Compared with Uninsulated Wall A, for Average Conditions in Vicinity of New York

No.		Wall B	Wall C	Wall D	Wall E	Wall F
1.	Saving in cubic feet of gas per 1000 sq. ft. of wall area due to insulation based on uninsulated wall A.....	39,800	54,300	66,100	51,500	62,000
2.	Dollar value of fuel saving based on average gas rate of $1 per MCF.....	$39.80	$54.30	$66.10	$51.50	$62.00
3.	Average additional cost of insulation per 1000 sq. ft. of wall area.....	$70.00	$180.00	$230.00	$150.00	$160.00
4.	Annual return on investment, considering fuel saving only.....	57%	30%	29%	34%	39%
5.	Radiation saving per 1000 sq. ft. of wall area for steam heat, sq. ft...	36.5	49.8	60.6	47.2	56.8
6.	Dollar value of radiation saving at $1 per sq. ft.	$36.50	$49.80	$60.60	$47.20	$56.80
7.	Net cost of insulation per 1000 sq. ft. of wall area after deducting radiation saving.....	$33.50	$130.20	$169.40	$102.80	$103.20
8.	Annual return on investment, considering fuel saving and radiation saving	*	42% +	39% +	50%	60%

*Insulation paid for in less than one heating season.

Wall A—Wood siding, building paper, sheathing, studding, wood lath, plaster.
Wall B—Wood siding, 1 in. rigid insulation, studding, ½ in. rigid insulation, plaster.
Wall C—Wood siding, 1 in. rigid insulation, 1 in. flexible insulation against the rigid insulation, ½ in. rigid insulation, plaster.
Wall D—Wood siding, 1 in. rigid insulation, rock wool fill between studding, ½ in. rigid insulation and plaster.
Wall E—Wood siding, building paper, sheathing, studding, 2 in. cork-board, ½ in. plaster.
Wall F—Wood siding, building paper, sheathing, rock wool fill between studding, wood lath and plaster.

tion, and is not excessive in cost. Ordinarily, where manufactured gas is used, in northern latitudes, a thickness of insulation sufficient to reduce the heat loss to 0.10 B.T.U. per hr. per sq. ft. per deg. F. or less is sufficient. For natural gas, a heat transmission factor between 0.10 and 0.15 is usually sufficient, provided the average gas rate is not over $1.

While the foregoing discussion has dealt primarily with frame walls, the same reasoning also applies to masonry walls and to roofs of various constructions.

Fundamentally, the utility companies are interested in selling more gas and more gas appliances. Exorbitant heating costs in many cases will defeat the sale of a gas installation. Proper insulation will reduce equipment and heating costs to the necessary degree, and thus often make possible the use of gas for heating purposes.

Facilities for quickly estimating the savings resulting from the use of a given type and thickness of insulation should be helpful in many cases. With this thought in mind, charts are presented for quickly estimating the saving in gas and the reduction in the required amount of radiation for any given job.

The chart shown in Fig. 3 is for estimating the saving in gas, and necessitates the use of a standard set of tables of heat transmission coefficients, such as Table 2, which is similar to those prepared for the A. S. H. V. E. 1930 *Guide*. By drawing three lines on Fig. 3 practically any fuel saving problem involving gas can be quickly solved.

Fig 2 is for estimating the saving in radiation for a steam or hot water system. By evaluating this saving and deducting it from the cost of the insulation, the net cost of the insulation can quickly be estimated. This radiation saving chart also makes it possible readily to determine whether or not a smaller size boiler can be used, which, of course, can also be credited to the cost of the insulation, and which will reduce the difference in first cost of the gas-fired installation.

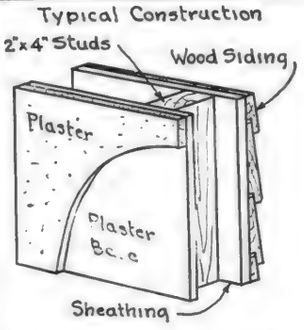
The importance of insulation in the use of gas as a fuel for house-heating cannot be over-emphasized, for without adequate insulation, buildings cannot usually be economically heated. If insulation, weatherstripping and storm windows are used, heating costs with gas can sometimes be reduced to the level of coal or oil for uninsulated buildings. If gas is to be used as a fuel, the installation of a substantial thickness of insulation is justified from the economic point of view. Moreover, the cost of the insulation is offset in a measure by the reduction in the size of the heating system. In exceptional cases, this saving may even be sufficient entirely to pay for the insulation. Charts are presented for estimating the fuel and radiation savings resulting from the use of insulation.

Table 2 – Coefficients of Transmission U of Wood Siding or Clapboard Frame Walls

The values of U in this Table are based on the following Internal Conductivities or Conductances which are expressed in B.t.u. per Hr. per Sq. Ft. per 1°F

Wood (Yellow Pine or Fir)	1.00 per 1"
Plaster (Gypsum)	2.32 per 1"
Plaster board 3.73 per $\frac{3}{8}$"	2.80 per $\frac{1}{2}$"
Cork board	0.30 per 1"
Wood Lath & Plaster	2.00 as applied
Rigid Insulation (Board form)	0.33 per 1"
Flexible Insulation	0.27 per 1"
Rock Wool (21#)	0.30 per 1"
Flaked Gypsum (24#)	0.48 per 1"

Typical Construction



Number	Type of Sheathing	Insulation between Studding	Plaster Base: Wood Lath A	Metal Lath B	$\frac{3}{8}$" Plasterboard C	$\frac{1}{2}$" Rigid Insulation D	1" Rigid Insulation E	$1\frac{1}{2}$" Corkboard F	2" Corkboard G
1	1" Wood [b]	None	0.262	0.275	0.263	0.198	0.153	0.117	0.098
2		Flaked Gypsum Fill (24#) [a]	0.096	0.098	0.096	0.086	0.076	0.067	0.060
3		Rock Wool Fill (21#) [a]	0.067	0.068	0.067	0.062	0.056	0.051	0.047
4		1" Flexible against Sheathing	0.133	0.136	0.133	0.114	0.097	0.082	0.072
5	$\frac{1}{2}$" Rigid Insulation (Board form)	None	0.220	0.229	0.221	0.173	0.137	0.108	0.092
6		Flaked Gypsum Fill (24#) [a]	0.090	0.091	0.090	0.081	0.072	0.063	0.058
7		Rock Wool Fill (21#) [a]	0.064	0.064	0.064	0.059	0.054	0.049	0.045
8		1" Flexible against Sheathing	0.121	0.124	0.121	0.105	0.091	0.077	0.068
9	$\frac{1}{2}$" Plasterboard	None	0.295	0.312	0.297	0.216	0.163	0.123	0.102
10		Flaked Gypsum Fill (24#) [a]	0.099	0.102	0.100	0.089	0.079	0.068	0.062
11		Rock Wool Fill (21#) [a]	0.069	0.070	0.069	0.064	0.058	0.052	0.048
12		1" Flexible against Sheathing	0.141	0.145	0.141	0.120	0.102	0.085	0.074

a Thickness of Fill assumed $3\frac{5}{8}$", based on 2"x4" Studding.
b Based on $\frac{25}{32}$", the actual thickness of 1" or $\frac{7}{8}$" Sheathing. Building Paper neglected.

Universities Including Heating and Ventilating in Curricula

In the September number, in which the universities teaching heating and ventilating were listed, there should have been included the course given by the School of Architecture of the University of California in heating and ventilating and power, plumbing, sanitation, lighting, elevators, vacuum cleaning, sprinklers, etc. Ths course is assigned three units of credit each semester or six for the year.

Horace W. Jones

Horace W. Jones, vice-president of Howe & Bassett, Rochester, N. Y., died September 27. Mr. Jones was born in that city in 1871, and after his public school work he began his career as a draftsman with Howe & Bassett in 1894. In 1913, he was elected vice-president. Mr. Jones was active in the Heating and Piping Contractors National Association and in 1924 he was elected a director and treasurer, an office he held until 1929. He remained a member of the board of directors until his death.

Alfred H. Payson

Alfred H. Payson, associated with the Plumbers Trade Journal Publishing Company, died of pneumonia in New York, September 27. Mr. Payson was born in San Francisco and also was educated there.

Gas Companies Urged to Cooperate with Heating Contractors

THE association year just ending will go down as the one in which the trade and dealer cooperation movement received more thought and attention than any previous one. You will recall that considerable time was allotted to this subject on last year's convention program. It was my pleasure to present a paper here last October in which was outlined some of the economic factors affecting this phase of our merchandising plans. Since that time I have talked about it to groups of plumbers and heating and piping contractors; to our own sales organization, and at some other meetings. I have served on Mr. Whitwell's Trade and Dealer Cooperation Committee; assisted in the directing of the Trades Relations Bureau of our own company and have also met with committees of steamfitters' and plumbers' associations. The opportunity of taking part in all of these activities and observing the growth of the movement throughout the country has not diminished my confidence in the belief that *the day is not far distant when the gas company that has not in successful operation a complete trade and dealer cooperation program will be an exception.*

The interim report of the Trade and Dealer Cooperation Committee of the American Gas Association, issued April 25, 1929, states that "the promotion of cooperative activities with trade and dealer outlets, such as plumbers, heating contractors and retail dealers, has received greater impetus in the past year than it ever has before." Of this there can be no doubt and a reading of the complete report of the committee will convince you that there are some sections of the country where well thought-out plans are in successful operation. Aside from the success of the plans that have been in operation for some time, those of us who have favored and advocated trade and dealer cooperation so strenuously in the past year are particularly pleased with the additions to our ranks of some companies that recently started to work on this interesting undertaking. Notable among these additions are the Brooklyn Union Gas Company and the Consumers Gas Company of Toronto, Canada.

A. J. Peters
Assistant General Sales Manager,
Consolidated Gas Company of New York

As to results, I suppose it is entirely true to state that there is no company in the entire membership of the American Gas Association that is not doing something, in one way or another, for the trades and dealers. Gas companies get a certain amount of business from the contractors and dealers with little or no effort and no special records are kept of these transactions. For this reason as well as the fact that a certain amount of the work that trades relations departments are engaged in produces more or less intangible returns, comparisons with previous years are quite difficult.

Our company did a certain amount of business with these agencies before the formation of our Trades Relations Bureau—never satisfactory, it is true—but, nevertheless, it was there. However, during the first eight months of this year we gave to the steamfitters, plumbers and other cooperating trades $95,616 in the form of discounts, allowances and commissions for the sale of appliances. This is quite a sizable amount even for a territory as large as that served by our companies and it represents considerable effort on the part of the 93 steamfitters, plumbers and heating and piping contractors who are displaying our appliances.

These 93 outlets were selected because of the location and attractiveness of the stores and shops and for the prominence of the men in their particular line of work. There is no doubt in my mind that you will agree that there is a tremendous psychological effect on prospects who see our appliances displayed in establishments of this kind, and no attempt can be made to evaluate the worth of this space to us. We are satisfied that our results are quite in keeping with the time and money spent.

Any attempt to prevent suggestions for the further development of our cooperative merchandise activities should start with a recounting of the economic factors that make it apparent why it is advisable for the gas industry to be actively engaged in this work. We all know that in spite of the tremendous increase in the purchasing ability of the public that the spirited race for a share of the consumer's dollar goes on apace and that the more serious competition is the indirect one produced by the newer industries, such as the radio, automobiles, moving pictures and amusements. We cannot hope to retain our rightful place in the industrial structure of the country unless we secure the proper outlets and representations before their services are utilized by these other industries and attractions.

We must establish friendly and cordial relations with agencies that are influences in the community and we must make it worth their while. Attractive discounts, allowances and commissions must be provided for the cooperating trades and dealers.

Provisions must be made to properly educate these forces so that gas service in all that that term implies will be sold and stay sold. Tactful, diplomatic representatives must be selected to form the contacts between our companies and the trades and dealers because within any cooperating group there is bound to be considerable difference of opinion.

Engineering as well as sales assistance must be provided for our sales allies and above all their shop windows and stores should receive our unstinted attention to see that the displays are as attractively presented as are our own.

All of our own advertising should be careful to state that approved appliances can be purchased through the trades. Advertisements in the plumbing and heating and piping contractors' trade journals should emphasize the attractiveness and advisability of cooperating with the gas industry.

Plumbers' prospects should be circularized with our direct mail advertisements but this should bear the plumbers' imprint. Our cooperating agencies should receive through us regularly the journals and publications that are published to stimulate merchandising efforts. In short, *everything should be done to convince the plumber, steamfitter and dealer that he is really an ally.*

From a paper, "Results from Cooperative Merchandise Activities and Suggestions for Further Development," read by A. J. Peters, Consolidated Gas Company of New York, at the Eleventh Annual Convention of the American Gas Association, Atlantic City, October 15, 1929.

Gas Conversions Gain Favor with Utilities

"Increased interest in gas house-heating brings with it increased interest in conversion burners. If this latter business can possibly be developed into good business, then gas companies should certainly provide for its exploitation . . ."

The above statement in the report of the Subcommittee on Conversion Burners, presented by the chairman, A. A. Pihlman, of the Consolidated Gas Company of New York, at the annual convention of the American Gas Association at Atlantic City, October 14-18, is significant in that it indicates that gas conversions are no longer viewed with suspicion by the utilities. The complete report of the committee is presented on this and following pages.

As gas companies establish wholesale rates for house-heating and proceed with their house-heating publicity campaigns, there will naturally be many inquiries as to the possibility of using existing coal-fired or oil-fired furnaces with conversion burners for gas. Most gas companies, especially the manufactured gas companies, naturally conservative, have avoided such business, preferring to lose the additional load or refer their prospective customer to some other agency if he could not be interested in a gas-designed furnace, rather than encourage the use of the conversion. Excessive operating cost and unsatisfactory heating service were considered to be objections to the use of a burner, which would result in its removal and consequent injury to the gas-heating business as a whole.

There are many instances in which a prospective customer for gas heating decides against its use because of the cost of a gas-designed installation even though the cost of operation is satisfactory and expert salesmanship has been practiced by the gas company's representative. In such cases the independent conversion burner agents and the local heating contractor find their prospects for burners. If the burner used is suitable and is properly installed with complete automatic control the installation may be satisfactory, but if the burner is not suitable, or the heating contractor, because of his lack of appreciation of the requirements for best efficency, does not properly install it, the installation certainly will not be satisfactory. So the reputation of gas heating will suffer in such cases without having had a fair chance to demonstrate its qualities under the best conditions.

In such situations it seems that gas companies should be prepared to arrange that good conversion installations be made, if conversion installations they must be. Increased interest in gas house-heating brings with it increased interest in conversion burners. If this latter interest can possibly be developed into good business, then gas companies should certainly provide for its exploitation, rather than let it be subject to the activities of all kinds of conversion burner agents and heating contractors, all well-intentioned, who might spoil some good business for lack of the gas companies' cooperation.

The general opinion of the gas companies toward conversion burners in the past has been unfavorable, due largely to the lack of complete automatic control such as is supplied with gas-designed furnace equipment and to lack of methods for applying gas heat to the various shaped coal-fired furnaces in an efficient manner. Many installations have proven faulty, more because of defects in the heating system other than the burner, all of which have contributed to the disrepute of the conversion installation.

There have recently been developed burners which are supplied with all of the automatic control and safety devices that gas-designed boilers are supplied with. Automatic controls are supplied for gas pressure, room temperature, steam pressure, water temperature, air temperature, secondary air supply and safety pilots with some burners. Automatic low water cut-off devices may be applied to some conversion burners when used in connection with steam jobs. With these devices, in connection with a suitable burner applied to a well-balanced heating system and a boiler of ample capacity, a customer will receive good heating service. Whether it is economical or not will depend upon whether the burner has been properly installed.

Burners are available for practically any size and shape of boiler having an output capacity up to 1600 sq. ft. of steam radiation. A complete classification of the various systems has recently been published in the A.G.A. Handbook on House-Heating, second edition, third printing.

An investigation of the amount of heating surface provided in coal boilers and gas boilers was made in order to discover whether there might be a lack of sufficient heating surface in coal boilers, per unit of rating, to develop their full rating. Of three coal-fired boilers investigated, there was a range of 4 to 8.2 sq. ft. of heating surface per 100 sq. ft. of steam radiation, equivalent A.G.A. rating, among the small boilers. Among the gas-designed boilers there was a variation of from 5.2 to 8.3 sq. ft. of heating surface per sq. ft. of steam radiation, A.G.A. rating. From these data it would appear that as far as the amount of heating surface is concerned, there is no limitation on the development of rating with a conversion burner. The development of rating then becomes a function of the effectiveness of the heating surface under the installation conditions. The flue spaces of a coal boiler are much larger than those of a gas-designed boiler, so it is probable that while the required amount of heating surface is available in a coal-fired boiler, yet a large portion of that surface is not as effective as that of a gas-designed boiler. This feature would tend to reduce the efficiency of the conversion installation below that of a gas-designed job.

Data on the operation of conversion burners in manufactured gas territories were collected from Baltimore, New York, Boston and Chicago. The Baltimore installations numbered 250 and represented the cumulative installations of burners since 1916. The experience was unfavorable, but sufficient data were not available to permit a detailed analysis of the reasons therefor. New York, Boston and Chicago have all just finished the first year of their experience with the organized exploitation of burners. In all cases the burners used were thoroughly tested in the respective company laboratories. Completely automatic control and safety devices were required, and the installation of the burners was carefully supervised. The record of gas consumption in each case averages some-

what higher than that for gas-designed boiler installations, but the customers are satisfied with their heating service and its cost, which is most important.

Individual figures for each group vary over such a wide range that the results are not considered sufficiently uniform to determine a definite relation with respect to the cost for gas-designed equipment. The range of units of gas consumption in cubic feet per degree-day per square foot of steam radiation is as follows:

	Low	High
Consolidated Gas Co. of N. Y.	.173	.349
Boston Consolidated Gas Co.	.106	.322
Peoples Gas Light & Coke Co.	.102	.298

The calorific value of gas in each case is 540 B.T.U. cu. ft. All of the figures are for a period of less than one heating season. A similar record for natural gas territory is that of Kansas City as follows: Calorific value of gas 1000 B.T.U./cu. ft.

	Low	High
Kansas City	.0543	.133

The experience of Kansas City with conversion burners is eminently satisfactory. Complete automatic control is provided with each burner installation to insure convenience and comfort. Economy is insured with installation by trained gas company men.

Straight Gas Equipment Sold in Preference to Conversions

In view of their experience, the three manufactured gas companies, noted above, feel that they should continue to promote the sale of gas for house-heating using gas-designed equipment primarily, but they also feel encouraged by their experience to offer to a prospective customer who wants to use his present coal or oil-fired furnace, a conversion burner with the understanding that with the careful installation attention they will provide, the cost of operation will be from 10% to 20% in excess of the cost with a gas-designed boiler.

In keeping with the thought of reducing the sales resistance caused by high installation cost to a minimum, a large manufactured gas company in one of the central states is now renting conversion burners for as little as five dollars a month. A small down payment is taken to offset at least part of the installation costs.

Servicing cost for conversion burner installations is approximately the same as that on a gas-designed boiler. Practically all of the servicing is required by the various automatic controls, which are similar in both types of installations. The life of baffles has not been determined as yet because of the short period of observation covered by this report.

The installation practice of all companies successful with their conversion burner business consists essentially in following the fundamental policies stated in the Report of the Sales and Service Policy Subcommittee of the House Heating Committee at the 1928 convention. A general survey of the installation should first be made to determine the suitability of the furnace for conversion. The size and shape of the firebox and other parts as fire door or ashpit door should be determined, to determine the proper burner equipment. The flue should be examined for installation of a back draft diverter, etc. The entire heating plant should be checked against the requirements of the building to determine whether adequate and properly distributed heat can be supplied. This is more necessary in manufactured gas territories, because there the gas company must provide not only automatic fuel service, but also a convenient and comfortable heating service, to justify its higher cost.

Installation is usually done under the supervision of the gas company, if not by the gas company. Installation does not require the special skill of a steam fitter or plumber, therefore it is proper that a gas man should make it. Tradesmen, especially if they are not familiar with the work, must necessarily charge much more for their work than the gas company would for the same job.

However the installation work is carried out, there certainly should be set up a standard of cooperation with the heating contractors in order that burners approved by the gas company will be used on their lines. In one city a productive lead commission of 10% is paid to the heating contractor for each customer who has a burner installed through the contractor's information or lead. The gas company makes the installation so that the heating contractor's commission is all profit. He is satisfied and the gas company has its approved burner installed.

Cooperation with heating contractors in this manner will not divorce their primary interest from gas-designed boilers. Their discount on the boiler is much larger and there is more profit in the work that goes with the installation. So, with cooperation on such a plan as noted above, the boiler business still remains their primary interest and yet conversion burner installations will probably be approved burner installations.

In a new installation the cost of a coal-fired boiler, in addition to a completely equipped automatic conversion burner, is about equal to that of a gas-designed system so that in new buildings, conversion burners should not present any problem. The conversion burner, if thoroughly tested for its adaptability to various types of boilers prevalent in the respective community, can be made to provide convenient and comfortable heating service with the usual heating systems fired with coal or oil. Their cost of operation is slightly higher than that with gas-designed equipment and that should be made plain always to the prospective customer.

A complete line of conversion burners, equipped for full automatic control, is available at present for meeting the desire of those who want to invest less than is required for a gas-designed system to enjoy gas heat. They may be stepping stones to gas boiler jobs. With careful supervision at the time of installation they seem to be good load builders.

Report of Subcommittee on Gas-Fired Unit Heaters

IN presenting this brief report on gas-fired unit heaters, W. L. Thompson, chairman of the subcommittee, stated that the committee was handicapped in securing specific data due to the fact that this method of heating is comparatively new on the market.

A questionnaire sent out brought in but few returns; most companies have only a few installations and they are mostly in the experimental stage.

There are about a dozen concerns making a gas-fired unit heater, most of them not on a large scale, but going ahead cautiously until their product is proven in the field. Two types are mainly in use. One type is designed with a large amount of radiating surface, using gravity burners and arranged for either manual or thermostatic control. Sizes vary from 75,000 B.T.U. to 350,000 B.T.U. input per hr. The other type uses a series of small brass tubes or pipes for the radiating surfaces and has a blast burner. This type is made in one size only, 100,000 B.T.U. input per hr. Both types use propeller type fans with direct connected motors, and both are arranged with safety pilots. Both also recommend heavy duty mercoid type thermostats.

There is no question in our minds as to the practicability of this type of heating, but considerable research, in our judgment, will have to be made—research in the application of the heaters, type of burner best suited, type of fan and motor equipment, method of suspension, automatic controls, etc.

Installations made are mostly in fac-

CINCINNATI, OHIO

Type Bldg.	*Temperature Difference*	*Heat Loss*	*C.I.R. Equiv.*	*Gas Cost Per Season*	*Gas Cost Sq.Ft. C.I.R.*	*Coal Cost Sq.Ft. C.I.R.*
Factory	0-65 & 70 Deg.	14,895,895	62,066	$13,046.87	$.2102	$.112
Factory	0-65 & 70 Deg.	1,312,500	5,469	680.00	124	.127
Sales Room	0-65	305,732	1,274	Est. 210.00	164	.102
Factory	0-60	1,826,350	7,609	2,014.00	.264	.105
Air Craft Bldg.	0-65	2,800,000	9,450	2,110.00	220	105

Cost of coal given is price on ground and does not take into consideration cost of handling, wages of firemen and engineer, cost of plant and equipment, maintenance, depreciation, value of space saved, etc.

CHICAGO, ILLINOIS

Type Building	*Heat Loss*	*Percentage Heating Season Used*	*Operating Cost*	*Estimated Heating Cost*
Warehouse	859,135	70%	$1,224.73	$1,750.00
Printing Shop		7.01%	24.97	356.00
Store	82,000	4.01%	22.64	565.00

tories and warehouses, but the uses of this method of heating can be considerably broadened to take in sales rooms, garages and the like. However, in most states garages are classed as having a gaseous atmosphere and the heaters are barred until they bear the Underwriters' approval, and we understand that no specifications yet have been set up for their testing. The committee would recommend that a testing code be set up by the A.G.A. Laboratory and all heaters of this type be tested and approved by this laboratory; also that a committee be appointed on this type of heating another year, to make a further study and a report for use of the industry.

Above is shown a tabulation of data on several installations, as observed during the past heating season.

Correspondence

Number of Gas Installations Exceeds Those Reported in October Issue

EDITOR HEATING AND VENTILATING:

Your article entitled "Gas House-Heating Shows Remarkable Increase" carried on pages 76 to 78 of the October issue of HEATING AND VENTILATING, lists certain statistics compiled by the American Gas Association covering installations of gas-fired central house-heating systems reported for 1929.

In spite of the fact that the second paragraph of your article states that these figures cover only the total house-heating installations of such companies as reported for both the years 1928 and 1929, comments received since publication of the article indicate that these figures have been accepted as a statement of the total number of gas-fired heating systems in use in the United States.

I feel that the attention of your readers should be called to the fact that the figures do not purport to be a statement of the total number of gas-fired heating systems in use today. Reports were received from only 136 manufactured gas companies, whereas there are approximately 650 manufactured gas companies in the United States. In the natural gas field the figures are even more incomplete as only 19 natural gas companies reported out of the total of approximately 400 in the United States. For these reasons the map carried on page 76 of your article is not significant as to total number of installations.

The primary purpose of the tabulation, as you know, was to disclose what growth had taken place in the number of house-heating installations of such gas companies as reported to us during the past two years, and also to make evident the trend in the growth of the conversion and straight gas-designed installations, and the increase in warm-air installations as compared to steam, hot water and vapor jobs. It is particularly difficult for the natural gas companies to ascertain the number of gas-heating systems in their territories on account of the fact that a large proportion of this equipment is not sold by these companies and because separate gas meters are rarely, if ever, installed to serve these installations.

The figures quoted in your article and map, therefore, should not be accepted as an indication of the total number of gas-fired central house-heating systems either in the manufactured or natural gas fields. Our annual statistical questionnaire which requests simply the number of house-heating customers will afford the best basis for ascertaining the total number of these installations.

J. W. West, Jr.,
Secretary, Commercial Section
American Gas Association.

Economical Insulation as a Factor in Its Adoption

EDITOR HEATING AND VENTILATING:

I have just completed reading the article "How the Field for Insulating Board Is Expanding," which appeared on page 97 of your October issue.

While it is true that insulation board now is often used as a plaster base or as a substitute for some other building material, there is another extremly important point to consider, namely, economical insulation.

To quote from Letter Circular 227, issued by the U. S. Bureau of Standards:

"If a layer of material is placed in the middle of a wide air space, such as that between the studs in a frame wall, greater insulating value is obtained than if the material is placed in contact with the sheathing, or as a plaster base. In the former case, the insulating layer not only furnishes its own insulating value, but, in addition, divides the air space into two parts, each of which has about the same insulating value as the original air space. The insulating value of an ordinary air space more than about 1 in. in width is equivalent to about ¼ in. of insulating material."

It is my belief that your readers are interested in insulating material from a strictly insulating standpoint, rather than from the standpoint of construction.

M. C. F.

St. Paul, Minn.

New Gas Rates for House-Heating

Effective September 1, Ithaca, Norwich, Oneonta and Cayuga Heights, N. Y., have been granted new rates to apply for house-heating. The rate also applies to general purposes, provided the general uses do not exceed 20% of the gas used for house-heating. The new rate consists of a fixed charge of $1 per month, plus 1c per sq. ft. of required steam radiating surface, plus a commodity charge of 8c (the commodity charge in Ithaca and Cayuga Heights is 7½c) per 100 cu. ft. of gas used.

In the Borough of Richmond, City of New York, new rates have been formulated, effective September 1, applicable to domestic customers for all purposes where gas is used for heating the entire building. The new rate is 15c per sq. ft. of radiation per year, $1 for the first 500 cu. ft. of gas or less, 14c per 100 cu. ft. for the next 4500 cu. ft., and 7½c per 100 cu. ft. for all over 5000 cu. ft. per month.

Indications are that the list of 275 companies actively promoting or about to promote gas house-heating, reported in HEATING AND VENTILATING for February, 1929, will be considerably larger by January 1, 1930.

Heating Troubles I Have Met

by the **TROUBLE ENGINEER**

I—When Water Leaves the Boiler

"PULL your fire! Hurry—There is no water in the boiler."

A heating contractor shouted to his foreman on the job, while he ran upstairs to the third floor. The Trouble Engineer stood in the boiler room at the side of a sectional cast-iron boiler, while the steam-fitter foreman pulled the fire. There was not a drop of water in the gauge glass and no water was discharged from the lower gauge cock on the water column. A few minutes before the gauge glass showed about 8 in. of water.

After the fire was pulled the Trouble Engineer asked the steamfitter foreman:

"Bill, why did your boss run upstairs?"

The answer was that they had a 1-in. valve placed on top of the main steam riser on the third floor and the boss hurried to open this in order to get the water back to the boiler. The foreman explained that it was the only means for accomplishing this. They had tried everything, he said, but the water would leave the boiler for some inexplicable reason.

When the boss returned, he requested the Trouble Engineer to proceed at once to locate the trouble.

According to Bill, the steamfitter foreman, the building was a three-story structure, containing 42 apartments, and was heated by a one-pipe gravity steam system.

"We have risers," he said, "going up to the third floor, one riser between two apartments and we run branches both ways. The main supply line is 6 in. part way around the building each way, (Fig. 2) and reduces to 4 in., 3 in. and 2½ in. No riser is smaller than 2½ in.

"On the end of the main, in wings C and D we run a drip to the return line (A and B, Fig. 2). Each riser also is dripped into the return. The 6-in. supply line (E) on top of boiler is pitched slightly upward to the point (F) where the 6-in. tee is located, so that the condensation or any water carried over by the steam will return to the boiler. In this line there is a valve to shut off the steam from the system.

"Ceiling radiators are installed on the basement ceilings and connected to a wet return (Fig. 4). No check valve is provided on the return to the boiler (Fig. 3).

"Connections to the radiators are regular size and at no place did we skimp on the pipe sizes. We also carried an equalizing pipe from the main to the boiler below the water-line."

Upon inquiry by the Trouble Engineer as to how the system acted, he remarked that after starting up with about 5 to 6 oz. of steam on the boiler, the water left the boiler.

"By way of the supply or the return?"

"I don't know."

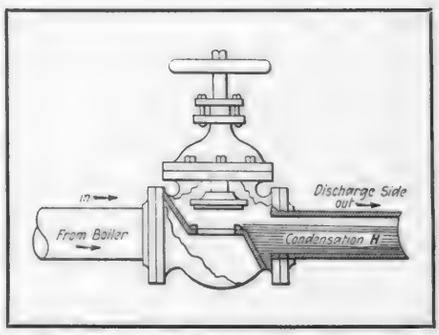


Fig. 1. Globe Valve Used in Steam Line

"What have you done to overcome this trouble?"

"We placed a 1-in. valve on top of the riser on the third floor and we open that valve to get the water back to the boiler."

After a careful checking of the layout and of all pipe sizes of the entire system, it was found that the job was well planned and executed. Neatness had been shown in the pipe fitting. All branches, as well as all risers, were of ample size for the work they had to do. When we got back to the boiler house the water had returned to the boiler and the gauge glass showed the water to be at the exact height it was before.

Water Left Boiler When Pressure Was 5 Oz.

A string was tied around the glass for a better check-up on the water level and the boiler was again fired very slowly. In about 30 min. the pressure gauge showed 5 oz. pressure and the water started to disappear from the boiler. We covered the fire with ashes and opened the valve on the first floor to get the water back to the boiler. Next we ordered the boiler to be fired up quickly with a very hot fire. In less than 15 min. the water started to leave the boiler in the same manner as before.

The fire was dumped and by opening the valve on the third floor the water returned to the boiler. On a close investigation of the return line it was found that no check valve was installed. This, of course, was not a mistake, be-

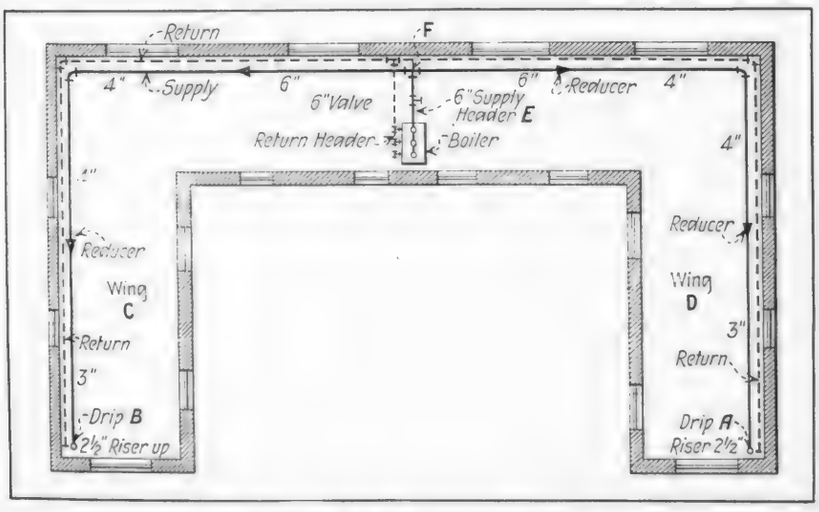


Fig. 2. Plan of Basement Piping

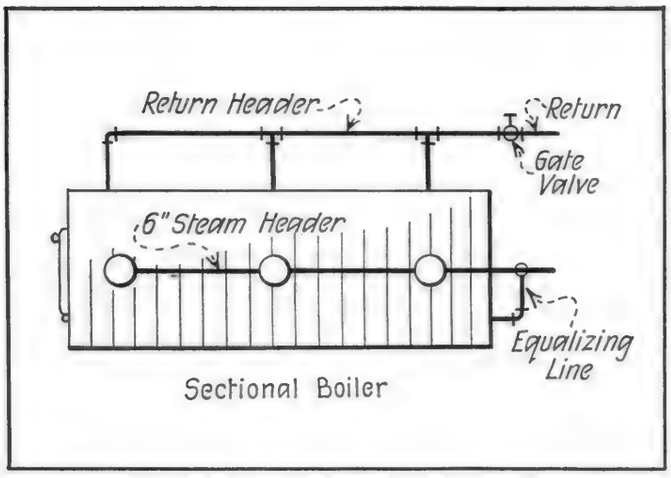


Fig. 3. Plan View of Boiler Connections

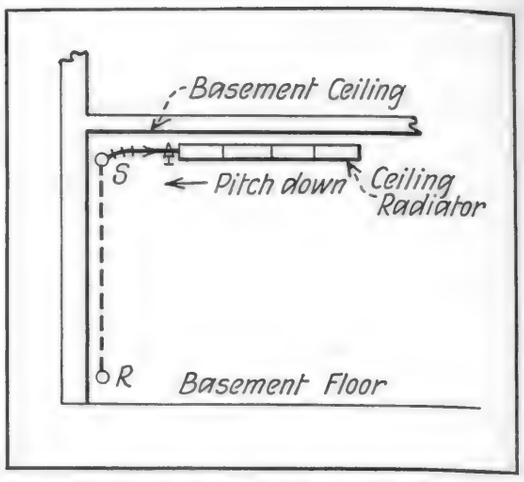


Fig. 4. Method of Dripping Ceiling Radiators

cause if a single-pipe gravity heating system is laid out properly and installed correctly, no check valve is necessary on the return line.

Here was an unusual condition and one that looked as if the water left the boiler by way of the return, which almost tempted the Trouble Engineer to overrule his better judgment and order a check valve installed on the return line.

After careful consideration of all the facts in the case, he was not at all satisfied that he knew whether the water left the boiler through the supply or through the return. The boiler was fired up again and he watched the return line closely with one hand on the pipe, to find out if the water left the boiler by way of the return. If it did, the return would become warm because the temperature of the water in the boiler was greater than that of the water in the return line.

Water Did Not Leave Through Returns

The condensation had to travel a considerable distance and the return line was not covered. In due time, the water began to disappear from the boiler again, but there was no indication that it left by way of the return line as the return-line temperature remained the same as before. The water could not leave by way of the supply line because to do this it had to be lifted to the ceiling of the basement, in order to accumulate in the ceiling radiator, or to the first floor radiators filling the 6-in. pipe line. This was not the case because we investigated and found that the condensation did not lodge in the pipe line.

There was only one other thing to do and that was to test for vacuum. In order to prove the case, we placed a compound gauge on the radiator farthest away from the boiler on the second floor. A vapor gauge was placed on one of the risers in order to check the pressure.

We fired up again and made frequent readings of the gauges. When the water began to leave the boiler, the reading of the vapor gauge on the boiler was 6 oz., the vapor gauge on the riser showed 1 oz. pressure and the compound gauge on the radiator showed 3 in. of vacuum. All of this seemed to indicate that the supply to the radiators was not sufficient.

Another check was made which proved that all risers, branches, supply lines, radiator valves, etc., were of ample area. The foreman suggested that we put a check valve on the return, close to the boiler, but we assured him that this would do no good because we were positive that the water did not leave by way of the return.

However, during the dinner hour he placed a check valve in the return and asked us to make another test. To satisfy him we did so, but the results were exactly the same. The check valve that he placed on the return was a swing check of light pattern. Water left the boiler at 5 oz. pressure. This convinced the foreman that the real trouble was elsewhere.

After spending almost the entire day to locate the trouble, it still remained unsolved. In the morning we climbed on top of the boiler to investigate the header and main line valve to see if it was wide open. It was, and all connections were made with ring gaskets, so there was no chance for a solid gasket or two, to be slipped in the flange.

When we were ready to climb down again, we took another look at the 6-in. main valve and made sure that it was wide open by closing and then opening it again. To our great surprise, we found that a globe valve was installed in place of a straightway valve.

Here was all our trouble. What happened was this. The 6-in. line filled with condensation on the discharge side, as indicated in Fig. 1, thereby reducing greatly the capacity of the line, as shown at H in the sketch. In order to reach the radiators, the steam had to pass over the condensation and in doing so condensed some more, leaving very little steam to reach the radiators. This was shown by the test data we had taken. Radiators not receiving sufficient amount of steam to fill them completely condensed the steam very rapidly, thus forming a partial vacuum, holding the condensation in the radiator, and causing the water to lower in the boiler.

Ceiling radiators in the basement held up large quantities of condensation and so did the radiators on the floors. The air in the radiators previously was discharged through the air vent and the ball check valve of the air vent prevented its return. When the 1-in. valve on top of the riser was opened, the vacuum was broken and the condensation returned to the boiler.

Trouble Eliminated When Globe Valve Was Removed

After a straightway valve was placed on the supply line and the globe valve removed, no further trouble was encountered. The Trouble Engineer then ordered the steamfitter to remove the flapper from the check valve on the return, in order to convince him that the heating system would operate satisfactorily without it, as soon as the proper balance was restored. No trouble of any kind has occurred since.

This incident shows clearly that under no circumstances should a globe valve be used on any horizontal line of a heating system. It may be used on a vertical line but never on a horizontal one or on a radiator branch line.

A Study of Electric House-Heating

by **A. R. STEVENSON, JR.,** *and* **F. H. FAUST**

General Electric Co., Schenectady N. Y.

IN the attempt to overcome a number of inconvenient features in the use of coal, such as shoveling it into the furnace and taking out the ashes, various methods of using oil or gas have been evolved. Very little attention, however, has been paid to the use of electricity as a source of heat, principally because it has been considered too expensive, although in every other way it may be considered as a nearly perfect heat source.

It is hardly necessary to point out the cleanliness and convenience of electricity. Anything that can be said concerning the cleanliness of gas is obviously even more true for electricity. With electricity, it is unnecessary to provide space for fuel storage; and by automatic control all labor can be eliminated.

In view of all these advantages it would appear that the use of electricity should be carefully investigated to determine its economic possibilities. It is the purpose of this paper not only to present the results of such an investigation or survey, but to show what has been done in the past and what is being done at the present in the way of electric house-heating. No attempt will be made to discuss electric heating for industrial purposes, but attention will be given only to electric heating of homes and buildings.

Direct Conversion of Electricity to Heat

There are two principal ways by which electricity can be utilized as a source of heat—the direct conversion of electricity to heat and the use of electricity as the source of energy to drive a heat pump. The direct conversion of electricity to heat may be accomplished in a number of ways, such as:

1. Using a metal resistance in an electric circuit to convert electricity into heat, which may be dissipated to the air directly from the resistance.

2. Using a fluid resistance such as water between two electrodes of an electric circuit and storing the heat in the water.

3. Using a copper tube as the secondary of a transformer. By passing water through the tube the heat formed in the tubing may be carried off in the water.

Any of these methods of directly converting electricity to heat may be accomplished at an efficiency of 100%. If, however, electricity is used as a source of energy to drive a heat pump, as was suggested by Lord Kelvin as early as 1852, it is possible to obtain an apparent efficiency greater than 100%. For instance, a refrigerator is one example of a heat pump. If it is driven by an electric motor, the heat output will be the sum of the heat equivalent of the electrical input and the heat pumped from the heat-absorbing element (the evaporator) to the heat-dissipating element (the condenser); consequently, the apparent efficiency, or the coefficient of performance of a refrigerating machine as it is called, is greater than one.

Since the use of a refrigerator as a heater has not been applied commercially, so far as we know, attention will be confined to the direct conversion of electricity to heat. As already mentioned, this conversion is consummated at an efficiency of 100%, but it is possible in most localities to obtain electric power off peak at lower rates than on peak power. By properly controlling the time of the conversion of electricity to heat, it is possible to obtain an apparent efficiency greater than 100% compared with on-peak power costs. This so-called off-peak method of electric heating will be covered in greater detail later; but first there will be reviewed some of the methods of heating where the use of the electricity is not confined to off-peak periods.

The first method that suggests itself is resistance heating by radiation or convection from hot wires or grids. Such a method is extremely adaptable and flexible, because heating elements can be placed in every room and can be regulated manually or automatically to give any desired temperature. The heating elements are also of simple construction so that the first costs are low and there is very little that can go wrong.

In the usual types of radiant heaters a hot wire is placed in front of a polished metal reflector of a refractory material, and the heat is radiated to the walls of the room and to objects in the room. The advantage of this type of heater is that a quick heat may be obtained locally, and it is possible to feel warm in front of a radiant heater even though the air itself is cool.

The convection type of heater is usually operated at a much lower temperature than the radiant type, and it is not at all necessary that the heater be visible in the room to be heated. The heat from the hot wires warms the surrounding air, which sets up convection currents, thereby distributing the heat to the room. This method of heating gives a fairly even distribution of heat, but it has the disadvantage that the top of the room is heated first.

The method of heating water by passing an electric current from one elec-

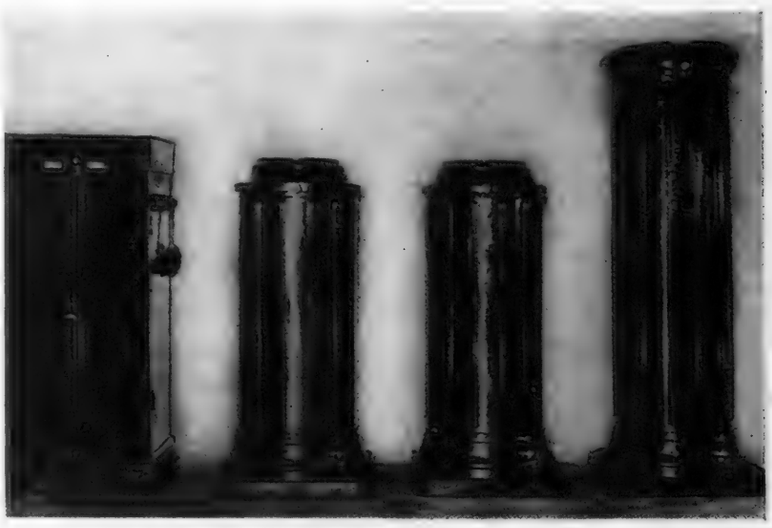


Fig. 1. The Four Storage Heaters Used in the Cork-Insulated House

Paper presented at the Third National Fuels Meeting, A.S.M.E., Philadelphia, Pa., October 7-10, 1929.

Fig. 2. Off-Peak Electric Power Is Utilized in this Warm-Air Thermal Storage System

Fig. 3. Tank and Radiator of the Hall Thermal Storage System

trode to another through the water has been used in Sweden, but it has had no practical application in this country.

The use of a copper tube as the secondary of a transformer to heat water has not been used practically. It is entirely feasible, although no great advantages over other methods are apparent.

Another method of resistance heating involves the heating of water by immersion heaters. This method is mainly used in off-peak heating systems, and it will be discussed in that connection.

Unfortunately, resistance heating with present on-peak power rates is far too expensive to interest the majority of people in this country, although it is recognized that under special circumstances the advantages of electric heat would outweigh the higher cost. It is understood that in England several department stores have been equipped to heat with electric-resistance heaters, but they have been able to get a rate of 1% per kw.-hr., which is considerably lower than the present rates in this country for on-peak power to be used in homes. It is interesting to note that, although the actual cost of electricity at 1 cent kw.-hr. was higher than the actual cost of coal, oil, or gas, the decision to use electricity was arrived at solely from financial considerations after the factors of cleanliness, depreciation, handling charges, convenience, etc., had been taken into consideration.

In this country, electric resistance heating has been installed in a few localities where power is cheap, principally along the Pacific Coast. It is a matter for speculation whether or not much progress will be made with this method of heating unless a rate of approximately 1 cent per kw.-hr. for on-peak power should be established. Such places as gasoline filling stations, small stores, lodgerooms, clubrooms, churches, waiting rooms, etc., could probably use this form of heating most economically.

Within the past couple of years a number of experiments have been conducted to determine the feasibility of using electric energy off peak in order to obtain low power rates and of storing the heat generated to be used as it is required. The theory behind the use of off-peak power is as follows: The basic cost of electricity consists of fuel, labor, and supplies, and investment costs. At low per cent load factors—i.e., when there are large peak loads and low average loads—the basic cost per kilowatt-hour is high. If an off-peak load can be introduced so that the off-peak demand never exceeds the on-peak demand, no additional investment is required and this item is excluded from the cost of generation of the electrical energy. Consequently, the utility companies can afford to give a very much lower rate to customers using energy off peak.

There have been a number of actual installations of off-peak heating systems made recently. The results of a few experiments on off-peak electric heating and the results from a number of commercial installations were described in recent articles.

Off-Peak Power May Make Electric Heating More Popular

Considerable work has been done in both an experimental and a commercial way by a new company which was organized about a year ago to engage in the engineering, design, research, and sales of electrical devices for the heating of buildings, both of commercial and domestic forms, and for the heating of water for domestic purposes. Part of its program consists in cooperation with the electric utilities for the improvement of load factor and for the purpose of obtaining off-peak power rates sufficiently low to make electric heating economically justified.

One type of off-peak heating system developed in Germany and described by E. B. Dawson and I. F. Lamb, uses pea gravel as the storage medium. This type of heater was designed to be placed directly in the rooms to be heated. It apparently operated satisfactorily except that in the comparatively warm weather in the spring and fall it was difficult to keep from storing too much energy in the heaters. Fig. 1 shows the appearance of several of these heaters, and Table 1 gives some information from a German leaflet describing them.

The Hall Electric Heating Company has developed several systems of heating with off-peak power, and in the short time since it was organized it has successfully installed a number of various types of heating systems. These were in operation during the whole or part of last winter.

This company's method of off-peak heating consists of insulated water-storage tanks, electric immersion heaters, heat-transfer surfaces, and suitable control devices. The electric immersion heaters are automatically turned on during the off-peak period of the system, and the heat is stored in an insulated tank at 250° to 300° F. The heat from the storage tanks is supplied thermostatically to the house as it is needed, either by circulating the hot water from

TABLE 1. STORAGE HEATERS IN INSULATED HOUSE

Rating, Watts	Dimensions in Inches		Net Weight without Gravel, lb.	Approximate List Price*	Weight of Gravel Required, lb.
	Height	Diameter			
3000	51.7	23.6	353	$118	320
5000	71.5	23.6	467	157	485

*Based on an exchange rate of 23.80 cents per mark.

the storage tank to conventional radiators in the rooms or by circulating air by forced draft through ducts to a finned-tube radiator placed near the storage tank.

The length of the off-peak period is determined by the characteristics of the load on the power station, but it usually lasts from 10 to 20 hrs. a day and usually at night. In Fort Wayne, for example, the power company allows customers to draw electricity at reduced rates from 9 P.M. to 7:30 A.M. and from 12 M. to 1 P.M. The off-peak period is determined by the power company, and it sets the control device in the heating system to give the desired results. The control contains a Telechron clock mechanism, which requires no winding, so that the heating system is entirely automatic.

Fig. 2 shows a typical warm-air installation by the Hall company in a home of average size, and Fig. 3 shows the interior construction of the warm-air heating system. It is claimed that it is possible to use only four warm-air pipes in this system as contrasted with twelve in a furnace installation. Also, owing to the forced circulation of air, no pitch is required, thus giving maximum headroom.

When a house is being constructed, a system can be adapted as shown in Figs. 4 and 5, thereby eliminating the necessity of a basement and reducing the duct work to a minimum.

Knowing the cost of fuel or electricity at any place and knowing the efficiency of the conversion into heat, it is possible to compute the amount of heat energy that can be obtained for a given sum of money. Of course, the price of fuel varies greatly from place to place, and the efficiency of conversion into heat is never constant from day to day even in the same plant. The efficiency of conversion is influenced by the type and size of furnace, the frequency and method of firing, the size and cleanliness of the chimney, the weather, and many other factors, so that any estimate that is made will be subject to considerable variation.

Such figures indicate that electric off-peak heating systems using electric energy at 1 cent per kw.-hr. are usually somewhat more expensive than coal or gas, from a heat energy standpoint. However, in considering this matter further it may be shown if it is possible to make electricity more attractive from a cost standpoint.

When the Hall Electric Heating Company installs a heating system, it endeavors to do or to have done the following things:

1. Insulate the house with some form of insulating material and add storm doors and windows.

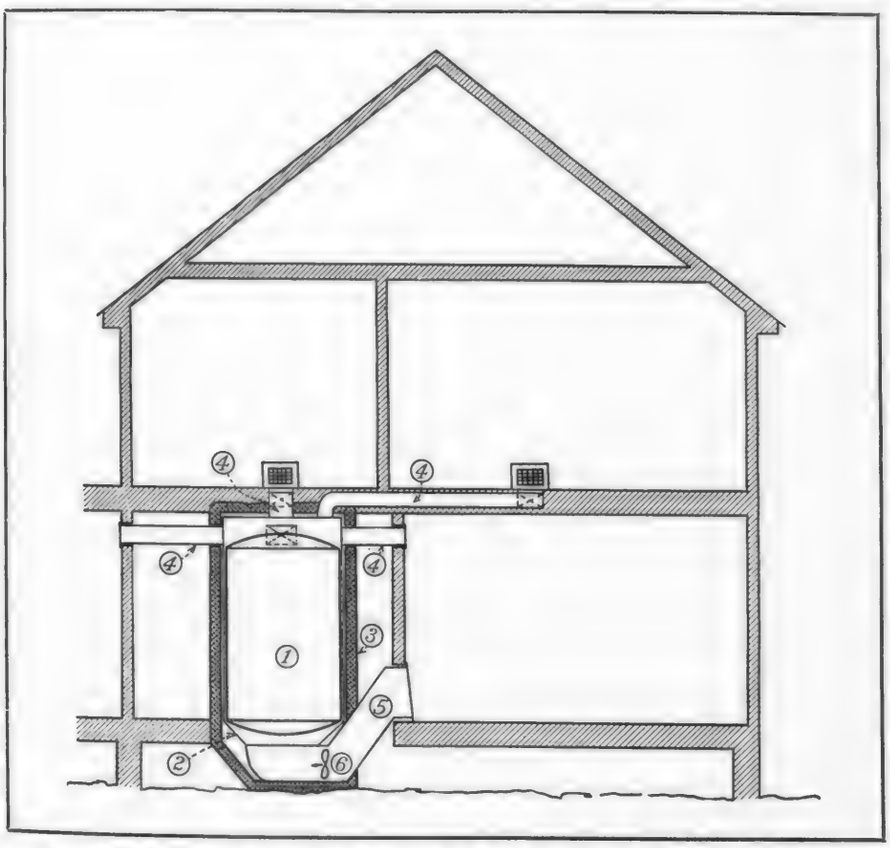


Fig. 4. Elevation Diagram of Home of Special Design for Application of Electric-Heating Warm-Air System

1—heat-storage tank; 2—sheet-metal casing to provide for passage of air over tank; 3—insulation inclosure around storage tank; 4—hot-air ducts to different rooms; 5—cold-air intake; 6—fan which provides positive circulation of heat.

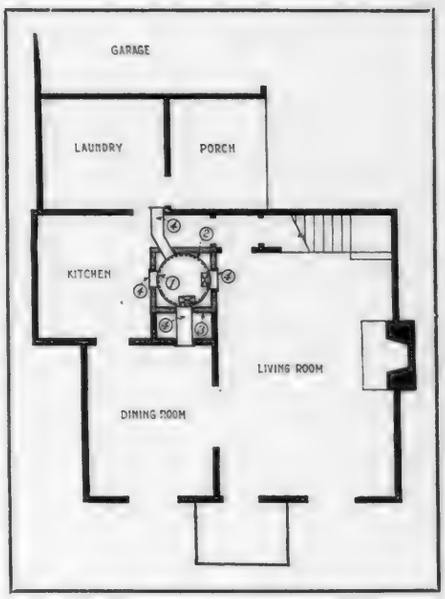


Fig. 5. Plan View of Hallmark Heating System

1—heat-storage tank; 2—sheet-metal casing to provide for passage of air over tank; 3—insulation inclosure around storage tank; 4—hot-air ducts to different rooms.

2. Automatically control the temperature in the house so that the temperature never becomes excessive at any time.

3. Reduce the temperature from 70° F. in the day time to 55° F. in the night time.

4. Instruct the occupants of the house to keep doors and windows closed as much as possible and to shut off bedrooms from the rest of the house when bedroom windows are opened during the night.

By thoroughly insulating a house it is possible to reduce the heating requirements by one-half, so that with the other savings effected the total cost of electricity for an off-peak heating system is not greatly in excess of the cost of coal, and perhaps somewhat less than the cost of gas. Of course, it may be reasoned that these savings could be applied to other heating systems and that consequently the electric method is unfairly favored. The fact remains, however, that in the majority of cases none of these savings would be effected with the usual type of heating system; therefore, if the company which installs electric heating can effect these savings, at least some part of the savings should be credited to the electric system.

The fact is or should be well established that the cost of heat energy is not the only factor entering into the operating cost.

When coal is used, a charge should be allowed for as handling and for labor involved in firing the furnace. The soot and dirt from a coal-burning installation will make it necessary to refinish the house and clean the draperies more often, and this should be taken into con-

sideration. The factors of convenience, cleanliness, and reliability are important but hard to evaluate.

Besides the operating charges mentioned, there are the fixed charges, which include depreciation, interest on the investment, heating-plant insurance, and taxes.

With the electric method of heating the following advantages are claimed:

1. Absolute cleanliness throughout the house, as there are no products of combustion.
2. Absolute safety.
3. Complete automatic control.
4. Quick heating. It is said that the house can be raised from 55° to 70° at a predetermined time in the morning in about fifteen minutes.
5. No fuel storage.
6. No labor required to operate the heating system.
7. Since electric heat uses no oxygen from the air and since there are no products of combustion, it should be the most healthful form of heat.

It is not claimed that off-peak electric heating is going to revolutionize present methods of heating with coal, oil, or gas. Even though this method were cheaper than all other methods there is the limitation that a power company can supply only a limited amount of off-peak energy because beyond that amount the energy becomes on peak. This is easily illustrated by an example. The average utility company will have a load factor* of approximately 45%. Any energy sold off peak which creates a peak higher than the normal peak cannot be sold economically at off-peak power rates. It is estimated that about 2%† of all the wired homes could be equipped with off-peak electric heating systems before the load factor reached its maximum practical value. This gives a potential market of about 400,000 installations in the United States based on present statistics.

It is recognized that electric heating is more expensive from a heat-source standpoint than other methods of heating, but in view of the extra advantages obtained, it would appear that it should be possible to sell a large number of this type of heating system.

Off-peak electric heating of homes is new in the United States, although it has been used for a number of years in several European countries. On-peak electric heating has had a limited application in this country, although in one or two localities it has been used extensively.

*Yearly load factor is the ratio of the average load in a year to the peak load in a short interval of time, usually 15 min.

†This is a hard figure to determine accurately. Others who have studied this subject thoroughly believe that 5% is a more representative figure. The smaller figure is used in order to be ultra-conservative.

Over 1000 Present at National Fuels Meeting

A record attendance of more than 1000 members and guests at the Third National Fuels meeting of the American Society of Mechanical Engineers held at Philadelphia, October 7-10, attested to the great interest which was aroused over the program of technical papers in which emphasis was placed upon domestic utilization of the various fuels and upon smoke abatement.

Perhaps the most interesting point of the meeting was the domestic session. While designed primarily to acquaint the general public with some of the principal fuel problems and their possible solution, the meeting attracted the technical as well as the non-technical men.

Seven papers were presented, covering the use of gas, oil, coal and electricity for house-heating and a general discussion of the economics of house-heating and insulation. So keen was the interest that the meeting lasted until after 11 o'clock.

Trade Practice Rules Adopted by Eastern Supply Association

At its 89th meeting, October 9-10, in New York, the Eastern Supply Association unanimously adopted the Trade Practice Rules as formulated in the final draft.

Harry G. Starr, of William H. Gallison Company, Boston, chairman of the subcommittee of the National Trade Practice Conference Committee, explained the nature and objects of the National Plumbing and Heating Institute, a permanent corporation within the industry, for interpreting, arbitrating and observing trade practice rules. The nature and the objects and purposes of the new institute briefly are as follows:

To conduct a systematic research in connection with the ethics and practices of the trade in plumbing and heating supplies and allied businesses.

To develop, adopt and promulgate uniform trade practices, and to amend the same whenever necessary or convenient for the more efficient conduct of the trade, or to comply with any federal or state law, rule, or regulation.

To act for and represent the industry in the study, development and promulgation of fair trade practices in connection with joint conferences with the Federal Trade Commission for the establishment of such rules and practices.

To receive, investigate and report to members and to the Federal Trade Commission the employment of practices as defined by the Federal Trade Commission to be unfair, and, in general, to use every effort to secure the general adoption of, and adherence to, the fair trade practices as defined by the Federal Trade Commission.

To act for the establishment of more equitable relations between individuals, firms, associations and corporations engaged in the business of manufacturing of, or dealing in, or with, plumbing and heating supplies and allied articles.

To act as arbitrator between members or between members and others, in relation to the conduct of business either in matters of determining principles of future conduct, or the settling of particular disputes which may develop.

The affairs of this corporation are to be conducted not for profit, but for the service and guidance of its membership.

New Edition of Harding and Willard

Welcome news to the heating and ventilating industry is the announcement of the long-awaited second edition of "Mechanical Equipment of Buildings—Heating and Ventilation," by Harding and Willard. The authors are L. A. Harding, vice-president of the American Society of Heating and Ventilating Engineers, formerly professor of mechanical engineering at Pennsylvania State College, and A. C. Willard, past president of the A.S.H.V.E., head of the department of mechanical engineering, University of Illinois. This work needs no introduction to readers of HEATING AND VENTILATING. Although the first edition, published in 1916, has long since been out of print, there have been thousands of calls for a new edition. The work ranks as the most authoritative reference book on the subject yet published. The new edition contains 963 pages as compared with 618 pages in the first edition.

The chapter on "Fuels and Combustion" has been enlarged to include additional information on oil burning; that on "Steam Heating Boilers and Hot Water Heaters" has been rewritten and more fully illustrated, additional data on boiler testing supplied, and capacity and dimension tables given for gas-fired boilers. The chapter on "Draft and Chimneys for Heating Boilers" presents all the important available data on this subject and includes instructions to architects, as well as data on back-draft diverters for gas-burning appliances, fireplaces, breeching, etc.

Data on "Heat Transmission of Buildings and Insulating Materials" embrace not only heat loss coefficients but an appendix entitled "Sun Effect on Roofs and Skylights," a subject treated in papers presented before the A.S.H.V.E., but neg-

lected in previous books on heating and ventilating.

"Fuel Consumption" is treated fully and information given on the use of the degree-day in connection with estimating fuel consumption. Data also are presented on the comparative cost of heating by coal, oil, gas and electricity. Data on "Heat Transmission and Dimensions of Direct Radiators" include all of the essential information on this subject. Equally full is the treatment of the effect of enclosures on radiator heat transmission and the effect of painting. Capacity tables have been brought up to date by including descriptions, illustration and capacity and dimension tables of tubular and concealed radiators.

Chapters on the various types of heating systems treat this subject in an exhaustive manner. A chapter on "Electrical Heating" discusses the cost of this method, as well as the appliances used.

Descriptions of the various methods and types of ventilating equipment, psychrometric chart, and the synthetic air chart are all discussed in a chapter on "Ventilating, Air Analysis and Ventilation Laws."

The chapter on "Warm-Air Furnace Heating Systems" has been greatly expanded. Most of the data given in this chapter is based on the tests conducted at the University of Illinois, and financed by the National Warm-Air Heating Association.

Of particular interest in connection with warm-air heating is the section on "Humidity in Furnace Heating," and a description of the special warm-air furnace systems, using fans, blowers, filters and humidifiers. The chapter on "Unit Heaters" includes descriptions of unit ventilators, suspended and floor-type unit heaters, direct-fired unit heaters, and typical layouts for various types of buildings using this method of heat distribution.

The chapter on "Air Conditioning, Air Washing, Humidifying, Cooling, etc.," has been enlarged, and various problems presented, together with their solutions. Among the other chapters are those on "Automatic Temperature and Humidity Control," "Central Station or District Heating," "Pipe, Fittings, Valves and Accessories," and "Preparation of Plans, Specifications and Estimates."

If there can be any criticism of the book, it is that automatic heating, as obtained with oil and gas burners and stokers, has been given little attention. However, in a reference book of this sort such an omission may not be particularly important, as the book on the whole is a successful attempt to present within two covers a vast amount of information.

Published by John Wiley & Sons, Inc., New York. Size 6¾ in. x 9¼ in. Pp. 963. Price $10.

Steel Heating Boiler Manufacturers Adopt Rating Code

A CODE for the rating of low-pressure steel heating boilers is announced by the Steel Heating Boiler Institute, a newly-formed organization representing the low-pressure steel heating boiler manufacturers. It supplements the boiler rating code of the A.S.H.V.E. relating to cast-iron boilers which will come up for adoption by the society at its annual meeting next January and has the approval of that organization. The action serves to bring together for the first time the various interests involved in the testing and rating of house-heating boilers.

At the time the proposed cast-iron boiler rating code was presented at the semi-annual meeting of the A.S.H.V.E., last June, it will be recalled that the steel boiler manufacturers objected to the code on the ground that:

1. The selection of boilers as based on the maximum capacity, would result in smaller steel boilers being used on a specific job as compared to present practice, with a consequent lowering of operating efficiency.

This code specifies minimum requirements, and it has been experienced that in similar codes, where minimum requirements are given, minimum requirements are used.

The present practice in selecting steel boilers gives a uniformly higher reserve capacity than as proposed by the code.

2. The proposed code does not consider heating surface, which is a prime essential in determining boiler capacity or ratings, and on which basis steel heating boilers have been rated and satisfactorily selected for a great number of years.

3. We object to the use of a multi-rating, as it would tend to cause confusion in an industry that has used but a single rating satisfactorily for a number of years.

4. We object to the use of anthracite fuel only as a basis for determining rating.

Our recommendations regarding the selection and rating of heating boilers are based on a practice which has proven to be satisfactory to both manufacturer and user throughout the entire life of the steel heating boiler industry, and are as follows:

(1) The published boiler rating shall correspond to the "estimated design load" as defined in Section 5 of the Code of Minimum Requirements, being the sum of Items A, B and C in Paragraph 1.

(2) The published boiler rating shall be determined by the amount of heating surface and grate area.

We are prepared to furnish your committee with exact information as to minimum ratios of rating to heating surface and heating surface to grate area to be employed in determining the rating for heating boilers.

Yours truly,

Kewanee Boiler Corporation
Pacific Steel Boiler Corporation
Heggie-Simplex Boiler Company
Oil City Boiler Works
International Boiler Works Company
Titusville Iron Works Company
Fitzgibbons Boiler Company, Inc.
Ames Iron Works
The Brownell Company
Erie City Iron Works

Code Result of Work Started in June

Following the summer meeting of the A.S.H.V.E., the steel boiler manufacturers took steps toward forming a Steel Heating Boiler Institute one of whose functions would be to prepare a code that would meet their views on the subject. Immediately upon the organization of the institute a committee was appointed to formulate such a code. Raymond Newcomb, of the Fitzgibbons Boiler Company, was chairman and the other members were C. E. Bronson, Kewanee Boiler Company; W. B. Russell, Heggie-Simplex Company; J. W. Turner, Pacific Boiler Corporation, and W. J. Heagerty, Oil City Boiler Corporation.

During the preparation of the code conferences were held with members of the Rating Code Committee of the A.S.H.V.E. and with the Sub-Committee on Boiler Output of the Heating and Piping Contractors National Association. Members of the A.S.H.V.E. committee stated informally that they would recommend the adoption of this code by the society to cover steel boilers, and limit the society's proposed rating code to cast-iron boilers.

At a meeting held September 10, the steel heating boiler code was unanimously adopted by the institute. As will be noted from a study of its provisions, the steel boiler manufacturers' code is confined to dimensional requirements based upon heating surface and grate area. In a sense it is merely a codification of present practice.

It will be noted further that this is a minimum code specifying the minimum heating surface of grate area to be furnished for a given rate. The committee feels that no doubt many manufacturers will continue to rate their

CINCINNATI, OHIO

Type Bldg.	Temperature Difference	Heat Loss	C.I.R. Equiv.	Gas Cost Per Season	Gas Cost Sq.Ft. C.I.R.	Coal Cost Sq.Ft. C.I.R.
Factory	0-65 & 70 Deg.	14,895,895	62,066	$13,046.87	$.2102	$.112
Factory	0-65 & 70 Deg.	1,312,500	5,469	680.00	124	.127
Sales Room	0-65	305,732	1,274	Est. 210.00	164	.102
Factory	0-60	1,826,350	7,609	2,014.00	.264	.105
Air Craft Bldg.	0-65	2,800,000	9,450	2,110.00	220	105

Cost of coal given is price on ground and does not take into consideration cost of handling, wages of firemen and engineer, cost of plant and equipment, maintenance, depreciation, value of space saved, etc.

CHICAGO, ILLINOIS

Type Building	Heat Loss	Percentage Heating Season Used	Operating Cost	Estimated Heating Cost
Warehouse	859,135	70%	$1,224.73	$1,750.00
Printing Shop		7.01%	24.97	356.00
Store	82,000	4.01%	22.64	565.00

tories and warehouses, but the uses of this method of heating can be considerably broadened to take in sales rooms, garages and the like. However, in most states garages are classed as having a gaseous atmosphere and the heaters are barred until they bear the Underwriters' approval, and we understand that no specifications yet have been set up for their testing. The committee would recommend that a testing code be set up by the A.G.A. Laboratory and all heaters of this type be tested and approved by this laboratory; also that a committee be appointed on this type of heating another year, to make a further study and a report for use of the industry.

Above is shown a tabulation of data on several installations, as observed during the past heating season.

Correspondence

Number of Gas Installations Exceeds Those Reported in October Issue

EDITOR HEATING AND VENTILATING:

Your article entitled "Gas House-Heating Shows Remarkable Increase" carried on pages 76 to 78 of the October issue of HEATING AND VENTILATING, lists certain statistics compiled by the American Gas Association covering installations of gas-fired central house-heating systems reported for 1929.

In spite of the fact that the second paragraph of your article states that these figures cover only the total house-heating installations of such companies as reported for both the years 1928 and 1929, comments received since publication of the article indicate that these figures have been accepted as a statement of the total number of gas-fired heating systems in use in the United States.

I feel that the attention of your readers should be called to the fact that the figures do not purport to be a statement of the total number of gas-fired heating systems in use today. Reports were received from only 136 manufactured gas companies, whereas there are approximately 650 manufactured gas companies in the United States. In the natural gas field the figures are even more incomplete as only 19 natural gas companies reported out of the total of approximately 400 in the United States. For these reasons the map carried on page 76 of your article is not significant as to total number of installations.

The primary purpose of the tabulation, as you know, was to disclose what growth had taken place in the number of house-heating installations of such gas companies as reported to us during the past two years, and also to make evident the trend in the growth of the conversion and straight gas-designed installations, and the increase in warm-air installations as compared to steam, hot water and vapor jobs. It is particularly difficult for the natural gas companies to ascertain the number of gas-heating systems in their territories on account of the fact that a large proportion of this equipment is not sold by these companies and because separate gas meters are rarely, if ever, installed to serve these installations.

The figures quoted in your article and map, therefore, should not be accepted as an indication of the total number of gas-fired central house-heating systems either in the manufactured or natural gas fields. Our annual statistical questionnaire which requests simply the number of house-heating customers will afford the best basis for ascertaining the total number of these installations.

J. W. West, Jr.,
Secretary, Commercial Section
American Gas Association.

Economical Insulation as a Factor in Its Adoption

EDITOR HEATING AND VENTILATING:

I have just completed reading the article "How the Field for Insulating Board Is Expanding," which appeared on page 97 of your October issue.

While it is true that insulation board now is often used as a plaster base or as a substitute for some other building material, there is another extremly important point to consider, namely, economical insulation.

To quote from Letter Circular 227, issued by the U. S. Bureau of Standards:

"If a layer of material is placed in the middle of a wide air space, such as that between the studs in a frame wall, greater insulating value is obtained than if the material is placed in contact with the sheathing, or as a plaster base. In the former case, the insulating layer not only furnishes its own insulating value, but, in addition, divides the air space into two parts, each of which has about the same insulating value as the original air space. The insulating value of an ordinary air space more than about 1 in. in width is equivalent to about ¼ in. of insulating material."

It is my belief that your readers are interested in insulating material from a strictly insulating standpoint, rather than from the standpoint of construction.

M. C. F.

St. Paul, Minn.

New Gas Rates for House-Heating

Effective September 1, Ithaca, Norwich, Oneonta and Cayuga Heights, N. Y., have been granted new rates to apply for house-heating. The rate also applies to general purposes, provided the general uses do not exceed 20% of the gas used for house-heating. The new rate consists of a fixed charge of $1 per month, plus 1c per sq. ft. of required steam radiating surface, plus a commodity charge of 8c (the commodity charge in Ithaca and Cayuga Heights is 7½c) per 100 cu. ft. of gas used.

In the Borough of Richmond, City of New York, new rates have been formulated, effective September 1, applicable to domestic customers for all purposes where gas is used for heating the entire building. The new rate is 15c per sq. ft. of radiation per year, $1 for the first 500 cu. ft. of gas or less, 14c per 100 cu. ft. for the next 4500 cu. ft., and 7½c per 100 cu. ft. for all over 5000 cu. ft. per month.

Indications are that the list of 275 companies actively promoting or about to promote gas house-heating, reported in HEATING AND VENTILATING for February, 1929, will be considerably larger by January 1, 1930.

Heating Troubles I Have Met

by the **TROUBLE ENGINEER**

I—When Water Leaves the Boiler

"PULL your fire! Hurry—There is no water in the boiler."

A heating contractor shouted to his foreman on the job, while he ran upstairs to the third floor. The Trouble Engineer stood in the boiler room at the side of a sectional cast-iron boiler, while the steam-fitter foreman pulled the fire. There was not a drop of water in the gauge glass and no water was discharged from the lower gauge cock on the water column. A few minutes before the gauge glass showed about 8 in. of water.

After the fire was pulled the Trouble Engineer asked the steamfitter foreman:

"Bill, why did your boss run upstairs?"

The answer was that they had a 1-in. valve placed on top of the main steam riser on the third floor and the boss hurried to open this in order to get the water back to the boiler. The foreman explained that it was the only means for accomplishing this. They had tried everything, he said, but the water would leave the boiler for some inexplicable reason.

When the boss returned, he requested the Trouble Engineer to proceed at once to locate the trouble.

According to Bill, the steamfitter foreman, the building was a three-story structure, containing 42 apartments, and was heated by a one-pipe gravity steam system.

"We have risers," he said, "going up to the third floor, one riser between two apartments and we run branches both ways. The main supply line is 6 in. part way around the building each way, (Fig. 2) and reduces to 4 in., 3 in. and 2½ in. No riser is smaller than 2½ in.

"On the end of the main, in wings C and D we run a drip to the return line (A and B, Fig. 2). Each riser also is dripped into the return. The 6-in. supply line (E) on top of boiler is pitched slightly upward to the point (F) where the 6-in. tee is located, so that the condensation or any water carried over by the steam will return to the boiler. In this line there is a valve to shut off the steam from the system.

"Ceiling radiators are installed on the basement ceilings and connected to a wet return (Fig. 4). No check valve is provided on the return to the boiler (Fig. 3).

"Connections to the radiators are regular size and at no place did we skimp on the pipe sizes. We also carried an equalizing pipe from the main to the boiler below the water-line."

Upon inquiry by the Trouble Engineer as to how the system acted, he remarked that after starting up with about 5 to 6 oz. of steam on the boiler, the water left the boiler.

"By way of the supply or the return?"

"I don't know."

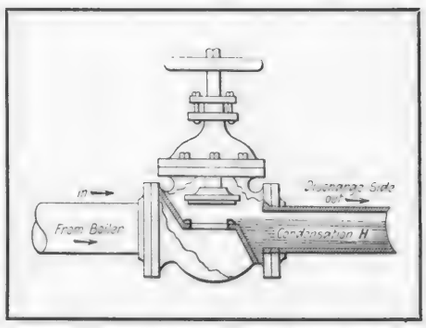


Fig. 1. Globe Valve Used in Steam Line

"What have you done to overcome this trouble?"

"We placed a 1-in. valve on top of the riser on the third floor and we open that valve to get the water back to the boiler."

After a careful checking of the layout and of all pipe sizes of the entire system, it was found that the job was well planned and executed. Neatness had been shown in the pipe fitting. All branches, as well as all risers, were of ample size for the work they had to do. When we got back to the boiler house the water had returned to the boiler and the gauge glass showed the water to be at the exact height it was before.

Water Left Boiler When Pressure Was 5 Oz.

A string was tied around the glass for a better check-up on the water level and the boiler was again fired very slowly. In about 30 min. the pressure gauge showed 5 oz. pressure and the water started to disappear from the boiler. We covered the fire with ashes and opened the valve on the first floor to get the water back to the boiler. Next we ordered the boiler to be fired up quickly with a very hot fire. In less than 15 min. the water started to leave the boiler in the same manner as before.

The fire was dumped and by opening the valve on the third floor the water returned to the boiler. On a close investigation of the return line it was found that no check valve was installed. This, of course, was not a mistake, be-

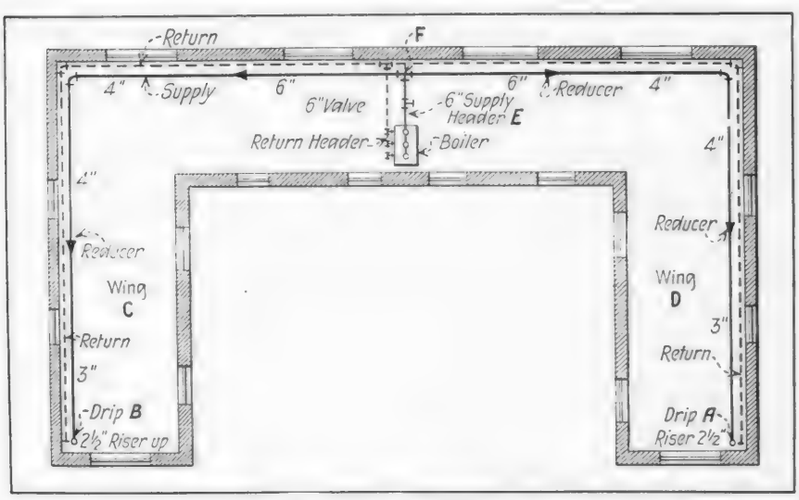


Fig. 2. Plan of Basement Piping

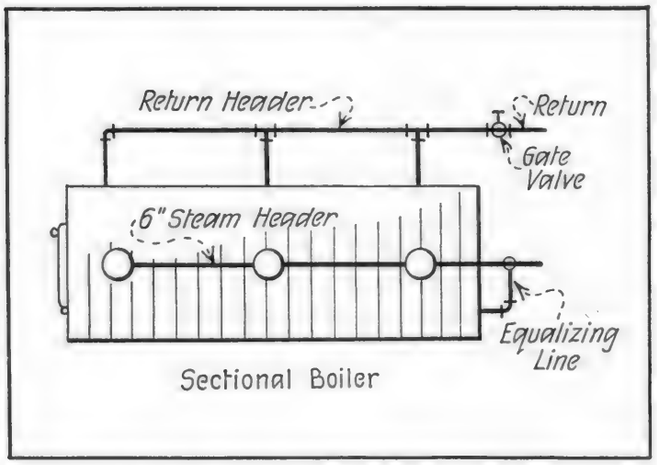


Fig. 3. Plan View of Boiler Connections

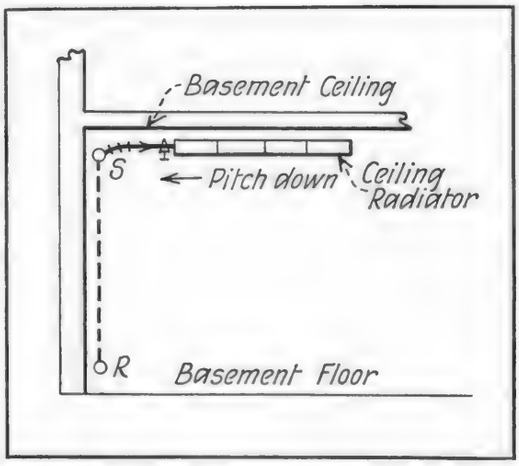


Fig. 4. Method of Dripping Ceiling Radiators

cause if a single-pipe gravity heating system is laid out properly and installed correctly, no check valve is necessary on the return line.

Here was an unusual condition and one that looked as if the water left the boiler by way of the return, which almost tempted the Trouble Engineer to overrule his better judgment and order a check valve installed on the return line.

After careful consideration of all the facts in the case, he was not at all satisfied that he knew whether the water left the boiler through the supply or through the return. The boiler was fired up again and he watched the return line closely with one hand on the pipe, to find out if the water left the boiler by way of the return. If it did, the return would become warm because the temperature of the water in the boiler was greater than that of the water in the return line.

Water Did Not Leave Through Returns

The condensation had to travel a considerable distance and the return line was not covered. In due time, the water began to disappear from the boiler again, but there was no indication that it left by way of the return line as the return-line temperature remained the same as before. The water could not leave by way of the supply line because to do this it had to be lifted to the ceiling of the basement, in order to accumulate in the ceiling radiator, or to the first floor radiators filling the 6-in. pipe line. This was not the case because we investigated and found that the condensation did not lodge in the pipe line.

There was only one other thing to do and that was to test for vacuum. In order to prove the case, we placed a compound gauge on the radiator farthest away from the boiler on the second floor. A vapor gauge was placed on one of the risers in order to check the pressure.

We fired up again and made frequent readings of the gauges. When the water began to leave the boiler, the reading of the vapor gauge on the boiler was 6 oz., the vapor gauge on the riser showed 1 oz. pressure and the compound gauge on the radiator showed 3 in. of vacuum. All of this seemed to indicate that the supply to the radiators was not sufficient.

Another check was made which proved that all risers, branches, supply lines, radiator valves, etc., were of ample area. The foreman suggested that we put a check valve on the return, close to the boiler, but we assured him that this would do no good because we were positive that the water did not leave by way of the return.

However, during the dinner hour he placed a check valve in the return and asked us to make another test. To satisfy him we did so, but the results were exactly the same. The check valve that he placed on the return was a swing check of light pattern. Water left the boiler at 5 oz. pressure. This convinced the foreman that the real trouble was elsewhere.

After spending almost the entire day to locate the trouble, it still remained unsolved. In the morning we climbed on top of the boiler to investigate the header and main line valve to see if it was wide open. It was, and all connections were made with ring gaskets, so there was no chance for a solid gasket or two, to be slipped in the flange.

When we were ready to climb down again, we took another look at the 6-in. main valve and made sure that it was wide open by closing and then opening it again. To our great surprise, we found that a globe valve was installed in place of a straightway valve.

Here was all our trouble. What happened was this. The 6-in. line filled with condensation on the discharge side, as indicated in Fig. 1, thereby reducing greatly the capacity of the line, as shown at H in the sketch. In order to reach the radiators, the steam had to pass over the condensation and in doing so condensed some more, leaving very little steam to reach the radiators. This was shown by the test data we had taken. Radiators not receiving sufficient amount of steam to fill them completely condensed the steam very rapidly, thus forming a partial vacuum, holding the condensation in the radiator, and causing the water to lower in the boiler.

Ceiling radiators in the basement held up large quantities of condensation and so did the radiators on the floors. The air in the radiators previously was discharged through the air vent and the ball check valve of the air vent prevented its return. When the 1-in. valve on top of the riser was opened, the vacuum was broken and the condensation returned to the boiler.

Trouble Eliminated When Globe Valve Was Removed

After a straightway valve was placed on the supply line and the globe valve removed, no further trouble was encountered. The Trouble Engineer then ordered the steamfitter to remove the flapper from the check valve on the return, in order to convince him that the heating system would operate satisfactorily without it, as soon as the proper balance was restored. No trouble of any kind has occurred since.

This incident shows clearly that under no circumstances should a globe valve be used on any horizontal line of a heating system. It may be used on a vertical line but never on a horizontal one or on a radiator branch line.

lected in previous books on heating and ventilating.

"Fuel Consumption" is treated fully and information given on the use of the degree-day in connection with estimating fuel consumption. Data also are presented on the comparative cost of heating by coal, oil, gas and electricity. Data on "Heat Transmission and Dimensions of Direct Radiators" include all of the essential information on this subject. Equally full is the treatment of the effect of enclosures on radiator heat transmission and the effect of painting. Capacity tables have been brought up to date by including descriptions, illustration and capacity and dimension tables of tubular and concealed radiators.

Chapters on the various types of heating systems treat this subject in an exhaustive manner. A chapter on "Electrical Heating" discusses the cost of this method, as well as the appliances used.

Descriptions of the various methods and types of ventilating equipment, psychrometric chart, and the synthetic air chart are all discussed in a chapter on "Ventilating, Air Analysis and Ventilation Laws."

The chapter on "Warm-Air Furnace Heating Systems" has been greatly expanded. Most of the data given in this chapter is based on the tests conducted at the University of Illinois, and financed by the National Warm-Air Heating Association.

Of particular interest in connection with warm-air heating is the section on "Humidity in Furnace Heating," and a description of the special warm-air furnace systems, using fans, blowers, filters and humidifiers. The chapter on "Unit Heaters" includes descriptions of unit ventilators, suspended and floor-type unit heaters, direct-fired unit heaters, and typical layouts for various types of buildings using this method of heat distribution.

The chapter on "Air Conditioning, Air Washing, Humidifying, Cooling, etc.," has been enlarged, and various problems presented, together with their solutions. Among the other chapters are those on "Automatic Temperature and Humidity Control," "Central Station or District Heating," "Pipe, Fittings, Valves and Accessories," and "Preparation of Plans, Specifications and Estimates."

If there can be any criticism of the book, it is that automatic heating, as obtained with oil and gas burners and stokers, has been given little attention. However, in a reference book of this sort such an omission may not be particularly important, as the book on the whole is a successful attempt to present within two covers a vast amount of information.

Published by John Wiley & Sons, Inc., New York. Size 6¾ in. x 9¼ in. Pp. 963. Price $10.

Steel Heating Boiler Manufacturers Adopt Rating Code

A CODE for the rating of low-pressure steel heating boilers is announced by the Steel Heating Boiler Institute, a newly-formed organization representing the low-pressure steel heating boiler manufacturers. It supplements the boiler rating code of the A.S.H.V.E. relating to cast-iron boilers which will come up for adoption by the society at its annual meeting next January and has the approval of that organization. The action serves to bring together for the first time the various interests involved in the testing and rating of house-heating boilers.

At the time the proposed cast-iron boiler rating code was presented at the semi-annual meeting of the A.S.H.V.E., last June, it will be recalled that the steel boiler manufacturers objected to the code on the ground that:

1. The selection of boilers as based on the maximum capacity, would result in smaller steel boilers being used on a specific job as compared to present practice, with a consequent lowering of operating efficiency.

This code specifies minimum requirements, and it has been experienced that in similar codes, where minimum requirements are given, minimum requirements are used.

The present practice in selecting steel boilers gives a uniformly higher reserve capacity than as proposed by the code.

2. The proposed code does not consider heating surface, which is a prime essential in determining boiler capacity or ratings, and on which basis steel heating boilers have been rated and satisfactorily selected for a great number of years.

3. We object to the use of a multi-rating, as it would tend to cause confusion in an industry that has used but a single rating satisfactorily for a number of years.

4. We object to the use of anthracite fuel only as a basis for determining rating.

Our recommendations regarding the selection and rating of heating boilers are based on a practice which has proven to be satisfactory to both manufacturer and user throughout the entire life of the steel heating boiler industry, and are as follows:

(1) The published boiler rating shall correspond to the "estimated design load" as defined in Section 5 of the Code of Minimum Requirements, being the sum of Items A, B and C in Paragraph 1.

(2) The published boiler rating shall be determined by the amount of heating surface and grate area.

We are prepared to furnish your committee with exact information as to minimum ratios of rating to heating surface and heating surface to grate area to be employed in determining the rating for heating boilers.

Yours truly,

Kewanee Boiler Corporation
Pacific Steel Boiler Corporation
Heggie-Simplex Boiler Company
Oil City Boiler Works
International Boiler Works Company
Titusville Iron Works Company
Fitzgibbons Boiler Company, Inc.
Ames Iron Works
The Brownell Company
Erie City Iron Works

Code Result of Work Started in June

Following the summer meeting of the A.S.H.V.E., the steel boiler manufacturers took steps toward forming a Steel Heating Boiler Institute one of whose functions would be to prepare a code that would meet their views on the subject. Immediately upon the organization of the institute a committee was appointed to formulate such a code. Raymond Newcomb, of the Fitzgibbons Boiler Company, was chairman and the other members were C. E. Bronson, Kewanee Boiler Company; W. B. Russell, Heggie-Simplex Company; J. W. Turner, Pacific Boiler Corporation, and W. J. Heagerty, Oil City Boiler Corporation.

During the preparation of the code conferences were held with members of the Rating Code Committee of the A.S.H.V.E. and with the Sub-Committee on Boiler Output of the Heating and Piping Contractors National Association. Members of the A.S.H.V.E. committee stated informally that they would recommend the adoption of this code by the society to cover steel boilers and limit the society's proposed rating code to cast-iron boilers.

At a meeting held September 10, the steel heating boiler code was unanimously adopted by the institute. As will be noted from a study of its provisions, the steel boiler manufacturers' code is confined to dimensional requirements based upon heating surface and grate area. In a sense it is merely a codification of present practice.

It will be noted further that this is a minimum code specifying the minimum heating surface of grate area to be furnished for a given rate. The committee feels that no doubt many manufacturers will continue to rate their

boilers as in the past and will provide more heating surface and grate area than are required by the code. The code differs from that of the A.S.H.V.E. in the fact that the latter is a performance code and all ratings are based upon performance data. The steel boiler manufacturers feel that this method presented so many uncertainties and difficulties from their point of view that they would not be warranted in abandoning their present practice.

Since the adoption of the code the Steel Heating Boiler Institute has appointed an additional committee which is now at work on a code covering oil, gas and stoker-fired boilers. This committee is composed of W. B. Russell, chairman, Fitzgibbons Boiler Company; C. E. Bronson, Kewanee Boiler Company; J. W. Turner, Pacific Boiler Corporation; W. J. Heagerty, Oil City Boiler Corporation, and C. B. Little of the Brownell Company.

Code for the Rating of Low-Pressure Heating Boilers as Adopted by the Steel Heating Boiler Institute, Sept. 10, 1929

1. The purpose of this code is to provide a uniform method of rating low-pressure heating boilers, hand-fired.

2. The rating shall be expressed as square feet of steam or hot water radiation or B.T.U. per hour.

3. For the purposes of this code 1 sq. ft. of steam radiation shall be considered equal to the emission of 240 B.T.U. per hr. and 1 sq. ft. of hot water radiation shall be considered equal to the emission of 150 B.T.U. per hr.

4. The rating of a boiler in square feet of steam radiation shall be not more than fourteen times the heating surface of that boiler in square feet.

For purposes of this code heating surface shall be expressed in square feet and include those surfaces in the boiler which are exposed to products of combustion on one side and water on the other. The outer surface of tubes shall be used.

5. The grate area of a boiler for the rating as determined by Section 4 shall be not less than that determined by the following formulae:

For boilers with ratings from 300 sq. ft. to 4000 sq. ft. of steam radiation,

$$\text{grate area} = \sqrt{\frac{\text{catalog rating (in sq. ft. steam radiation)} - 200}{25.5}}$$

For boilers with ratings of 4000 sq. ft. of steam radiation and larger,

$$\text{grate area} = \sqrt{\frac{\text{catalog rating (in sq. ft. steam radiation)} - 1500}{16.8}}$$

For the purposes of this code grate area shall be considered as the area of the grate surface expressed in square feet and measured in the plane of the top surface of the grate. For double-grate boilers the grate area shall be considered as the area of the upper grate plus one-quarter the area of the lower grate.

6. Boilers selected on a basis of this code shall be connected to a stack and breeching in accordance with the manufacturer's specifications.

7. The ratings as defined above for purposes of selection are intended to correspond to the estimated design load, which is to be the sum of items A, B, and C.

A. The estimated normal heat emission of the connected radiation required to heat the building as determined by accepted practice expressed in square feet of radiation or B.T.U. per hour.

B. The estimated maximum heat required by water heaters or other apparatus connected to the boiler, as expressed in square feet of radiation or B.T.U. per hour.

C. The estimated heat emission of piping connecting radiation and other apparatus to the boiler expressed in square feet of radiation or B.T.U. per hour.

Formation of National Plumbing and Heating Institute

ANNOUNCEMENT is made of the organization of a National Plumbing and Heating Institute, which was the outcome of a meeting called by the Division of Trade Practice Conference of the Federal Trade Commission, held in New York, September 23. Among its objects are the following:

"To conduct a systematic research in connection with the ethics and practices of the trade in heating and plumbing supplies and allied businesses.

"To develop, adopt and promulgate uniform trade practices, and to amend the same whenever necessary or convenient for the more efficient conduct of the trade, or to comply with any federal or state law, rule, or regulation. By education or other means to cause trade practices, as determined upon, to be accepted and adopted as the standard and uniform trade practices, and to obtain recognition of the same as official by governmental or regulatory agencies.

"To act for and represent the industry in the study, development and promulgation of fair trade practices in connection with joint conferences with the Federal Trade Commission for the establishment of such rules and practices.

"To receive, investigate and report to members and to Federal Trade Commission the employment of practices as defined by the Federal Trade Commission to be unfair, and, in general, to use every effort to secure the general adoption of, and adherence to, the fair trade practices as defined by the Federal Trade Commission.

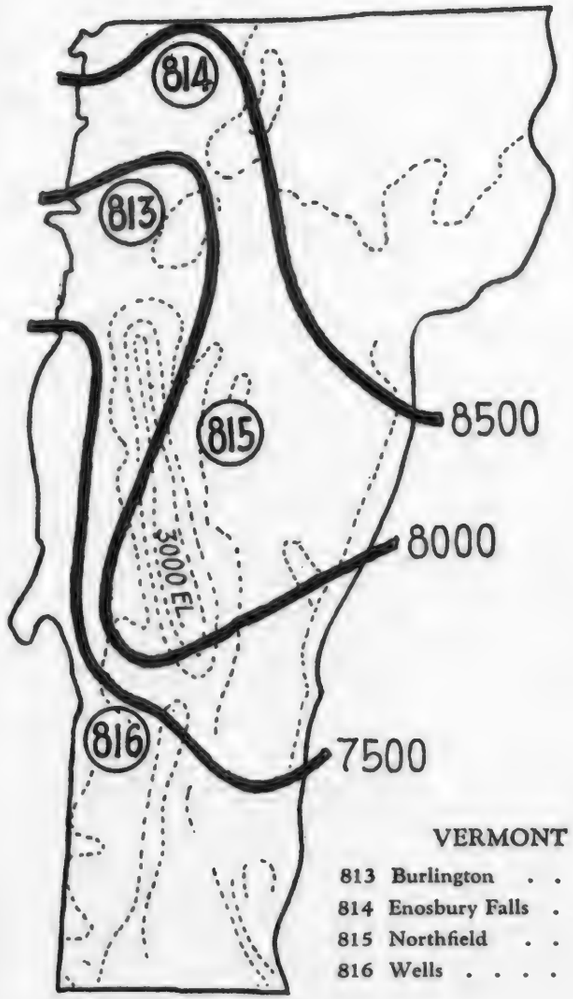
"To act for the establishment of more equitable relations between individuals, firms, associations and corporations engaged in the business of manufacturing of, or dealing in, or with, plumbing and heating supplies and allied articles.

"To act as arbitrator between members or between members and others, in relation to the conduct of business either in matters determining principles of future conduct, or the settling of particular disputes.

"To have one or more offices to carry on all or any of its operation and business in any of the cities, districts, territories or colonies of the United States.

"The affairs of this corporation are to be conducted not for profit, but for the service and guidance of its membership, and the corporation shall neither possess nor exercise any rights or powers whatsoever with respect of the business, and procedure, and the manner and method of conducting the same, of any of the members of this corporation, nor shall it be permissible so to amend the charter, articles of organization or by-laws of this corporation as to give sanction to the elimination by, or consolidation within, this corporation, of the trade associations comprising its membership, or as to enable this corporation to manage the affairs of its members or to control their operations and procedure.

"Membership in this corporation shall be open to any association or membership corporation, the members of which are engaged in the manufacture of, or in the sale only at wholesale of, heating and plumbing supplies and allied businesses in the United States of America, upon such conditions and by such methods as may be required in the by-laws of this corporation, or as may be determined upon from time to time by the board of directors."



VERMONT

813	Burlington	7620
814	Enosbury Falls	8387
815	Northfield	8420
816	Wells	7937

ISO-DEGREE-DAY CHARTS—Vermont

No. 5-B
New Series

MASSACHUSETTS

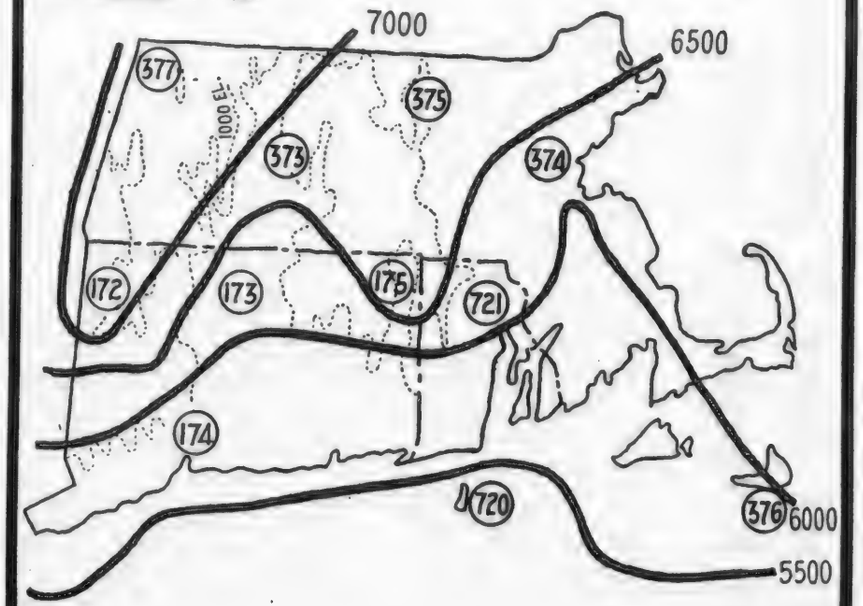
373	Amherst	6958
374	Boston	6145
375	Fitchburg	6732
376	Nantucket	6059
377	Williamstown	7221

RHODE ISLAND

720	Block Island	5485
721	Providence	6014

CONNECTICUT

172	Cream Hill	7137
173	Hartford	6037
174	New Haven	5895
175	North Grosvenor Dale	6799



ISO-DEGREE-DAY CHARTS—Massachusetts, Rhode Island, Connecticut

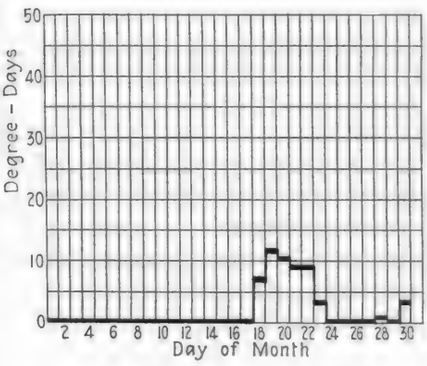
No. 5-C
New Series

Monthly Heating Load in Degree-Days in Nine Typical Cities

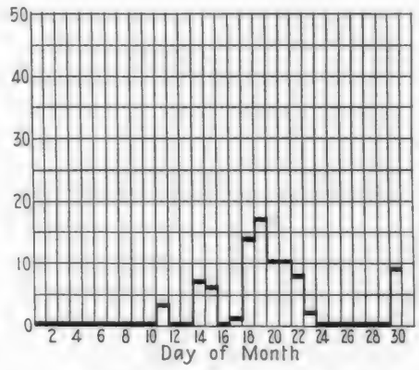
DEGREE-DAY charts for nine cities for the month of September are presented below. Although in some cases the number of degree days is an unimportant percentage of the total for the season, charts for other cities indicate that September requires a not inconsiderable portion of the year's fuel consumption.

Coined by the American Gas Association, the unit degree-day is the product of one degree in temperature and one day. When the average daily temperature falls below 65°, the heating load is proportional to the difference between the daily temperature and 65°, and the number obtained by subtracting the average temperature from 65° represents the number of degree-days for that day. For example, if the average daily temperature is 45°, the degree-days for that day total 20.

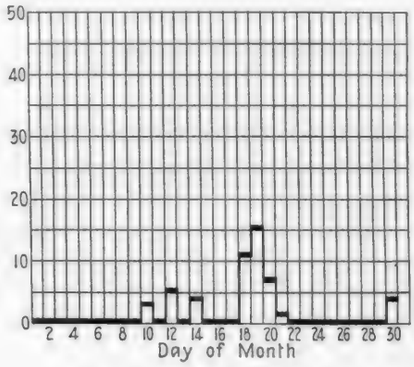
The degree day is being used to a greater extent every day, in connection with fuel consumption, calculations for insulation, and other problems involving a consideration of the heating load.



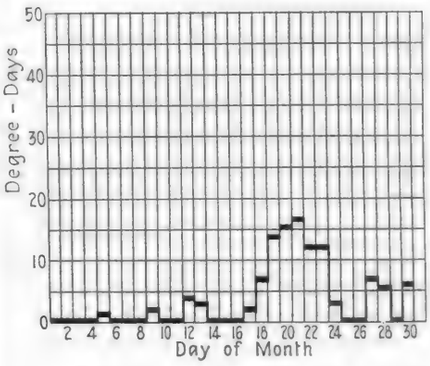
New York, September, 1929
Degree-Days 54



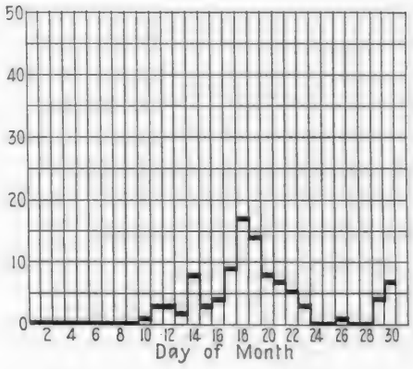
Pittsburgh, September, 1929
Degree-Days 87



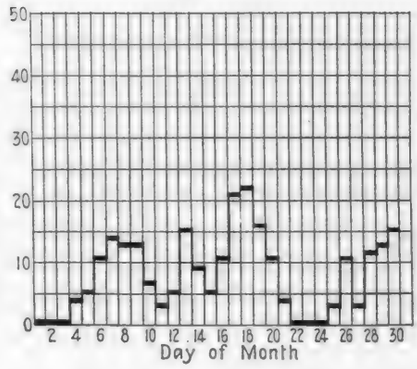
St. Louis, September, 1929
Degree-Days 51



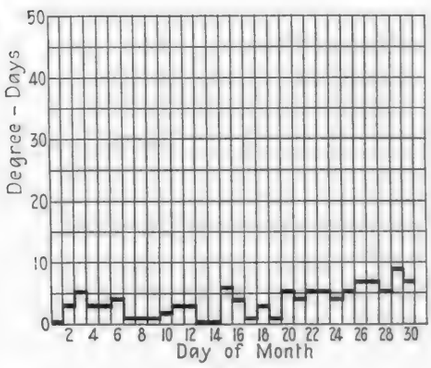
Boston, September, 1929
Degree-Days 107



Chicago, September, 1929
Degree-Days 99



Minneapolis, September, 1929
Degree-Days 246



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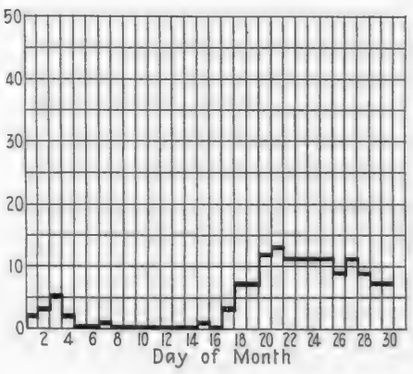
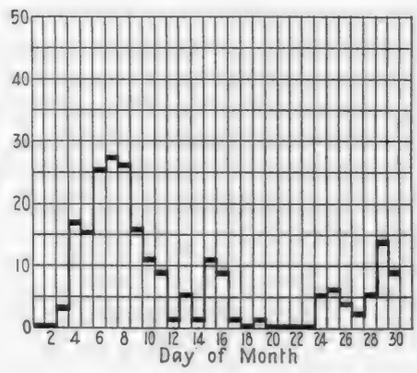


Seattle, September, 1929
Degree-Days 143



Denver, September, 1929
Degree-Days 223

Certified Heating Explained to New York Chapter

AT the first fall meeting of the New York Chapter, held in the Building Trades Club, October 21, M. E. Durkee, manager of the Certified Heating Department of the Heating and Piping Contractors New York City Association, was the principal speaker. His subject was "Certified Heating—What It Is, How It Operates, and What We May All Do to Make It More Effective."

President E. J. Ritchie introduced Rudolf Kuehlmann, who will be in charge of the membership contest. Following this, William E. Taylor, executive secretary of the Heating and Piping Contractors New York City Association, spoke briefly on the subject of Certified Heating before introducing Mr. Durkee. Abstracts from Mr. Durkee's speech follow:

Certified Heating is an identity, a trademark or a "measuring stick" for the right heating installation for any particular building. Certified Heating is national in its application, and operates by a uniform plan under the direction of the national association. It is being rapidly expanded to a point where it will be available in every community through every contractor who is regularly engaged in the heating business.

Certified Heating installations are regulated by a code of standards prepared and maintained by a committee composed of leading heating engineers and contractors from various parts of the country. These standards take into consideration where the building is located, how and of what materials it is constructed. They govern all parts of the installation such as calculation and distribution of radiation, size and arrangement of piping and capacity of boiler with suitable chimney.

Certified Heating is intended to regulate the class of work for which it is not customary to employ a consulting engineer. Within the scope of the New York City Association it applies to residence abodes up to six stories in height and commercial loft buildings up to ten stories in height.

Let us consider the industry as a whole, and the need for identification and regulation. The manufacturer endeavors through various kinds of advertising to interest the public and persuade the buyer to select his apparatus. He pictures the comfort and satisfaction to be obtained. He coins trade-names and policies such as furnishing a bond in an attempt to create confidence but in the end he must admit that he has no control over the installation and consequently should not be expected to assume responsibility for the results of the installation. While their efforts may create favorable impression, the prospective owner is left without a measuring stick for the right installation for his needs. Every manufacturer must admit that even though their apparatus is the best of its kind, it will not function properly unless correctly installed.

Coal, oil and gas companies are criticized for failure of their fuel to provide satisfactory results, but statistics show that over 60% of the cases of complaint are due to the installation. Regardless of the kind of fuel the installation must be right to give proper results and yet those who furnish the fuel have little or no control over the installation.

Certified Heating provides the architect with a means to identify the reliable contractor, and to specify heating with the assurance that his client will obtain satisfactory results without further responsibility on his part.

The contractor or builder who buys a Certified Heating installation obtains a trade-mark of quality which enables him to participate in the results of the advertising and activities of the national and local associations. He will be assisted in financing, for the loan agencies recognize the value to the property and the stability of the loan based on this trademark. The builder will have less difficulty in leasing or selling the property, for the prospective tenant or owner recognizes the trade-mark and what it means to him.

The heating contractor who is licensed to furnish Certified Heating has something very definite to sell for which he may obtain a price which will net him a fair profit, for his customer knows what results he is buying.

As Certified Heating becomes more effective there is bound to be established a fairer and better basis of business. The contractor having something definite to sell should be less concerned

Certified Heating Supplement

CERTIFIED HEATING Assures Comfort

To Specimen

© HAPCNA

The undersigned a member of The Heating and Piping Contractors New York City Association, Inc., and if awarded the contract for this installation hereby agrees to perform the work in accordance with the Certified Heating Standards adopted by The Heating and Piping Contractors New York City Association, Inc., and approved by the Heating and Piping Contractors National Association, and that at the completion of the work and upon final payment agrees to deliver you a certificate duly signed and sealed by the said HEATING AND PIPING CONTRACTORS NEW YORK CITY ASSOCIATION, Inc., certifying that the heating system installed under said contract has been installed in accordance with the said Certified Heating Standards.

Signed .....

New York, N. Y. ..... 19?

Supplementary Certificate Given to Owner Prior to Making Installation

Plate for Boiler, Certified Heating Installation

with prices. When the present practice of gambling to become the low man is eliminated there is going to be less substitution and shopping of prices with the resulting degradation which now exists. Each contractor will know that his competitor must furnish a certain capacity of equipment. By elimination of the irresponsible contractor and the establishment of fairer prices, the credit situation, which presents such a serious problem to the sources of supply, will be greatly improved.

How does Certified Heating operate?

After the adoption of Certified Heating by the New York City Association one of the first steps was to outline and proceed with advertising to acquaint the public and those interested in the industry with the services we are offering.

A series of four announcements was prepared and mailed over a period of two months to all subscribers of the Dow Service in the New York territory, and to approximately 2000 architects, engineers, general contractors, manufacturers and loan agencies who are included in our mailing list.

Literature Sent to Prospective Builders

Three sets of circulars from the national advertising of the association have been distributed to our mailing list. We have subscribed to Dow Service and each day anouncements, circulars and many letters are sent to those interested in the construction of a building of the Certified Heating class.

Every member of the Heating and Piping Contractors New York City Association must offer a Certified Heating installation wherever it applies and he should attach the Certified Heating Supplement, to show that he is licensed to furnish a Certified Heating job and that he is offering that quality of installation. Every one of the members is provided with a copy of these standards and is familiar with the requirements for Certified Heating. Contractors will prepare their bids on the basis of the architect's building plans. The contractor who is awarded the contract must furnish the Association headquarters with two sets of plans showing what he intends to furnish, together with sufficient information concerning the building to permit the headquarters to check the layout. These plans must be checked against the standards and approved before the contractor starts his work.

One set of approved plans is retained in the association file as a record and for use in making the two inspections. When the installation has been completed and approved the contractor is given the Certified Heating boiler plate, certificate and the National Surety Bond. He attaches the plate to the boiler as permanent identification of the installation. He delivers to the owner the Certified Heating certificate through which the whole association endorses the installation and the National Surety Bond as absolute guarantee that the installation will meet the conditions specified in contract. We are requesting all who may have occasion for complaint against a Certified Heating installation to report the difficulty at once to the association and we will make certain that prompt and proper attention is given.

What we all may do to make Certified Heating more effective.

If the two previous questions have been answered clearly it should be apparent that Certified Heating has something to offer each one in the industry, and that each should assume his obligation for his own welfare.

Certified Heating is an ideal based on sound principle. Its power to benefit the industry is what the industry makes of it. Before we can do anything worth while we must each satisfy ourselves that it will benefit the industry and ourselves, then we must make a sincere effort to further the plan at every opportunity. Talk, recommend, and endorse Certified Heating on every occasion.

The problems facing the heating industry today warrant the most careful thought and sincere effort by each one whose livelihood comes from the heating business. Certified Heating provides an ideal medium through which all branches of the industry may cooperate.

In my opinion the Certified Heating Bureau has but one function to perform and that is to render a service.

We need to create confidence within and for the heating industry. We must be sincere to create confidence, therefore in your efforts for Certified Heating, be sincere.

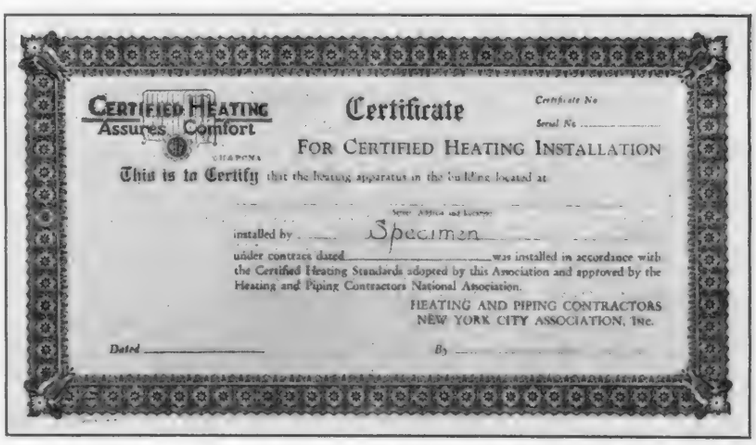
Mr. Durkee made it clear that the layout is made by contractors and their organizations only when a consulting engineer is not employed. A certified heating installation can be installed when an engineer is employed, as the association, knowing that the engineer is reliable, takes the entire responsibility and guarantees the heating system.

Local Committee for Society's Annual Meeting

Announcement is made of the appointment of a local committee of Philadelphia members to have charge of the society's annual meeting in Philadelphia next January. The committee consists of John Cassell, honorary chairman; R. C. Bolsinger, general chairman of arrangements; Lee Nussbaum, finance committee chairman; M. E. Gillett, ladies' entertainment committee chairman; S. E. Mensing, transportation and publicity committee chairman, and A. J. Nesbitt, banquet committee chairman.

Nominations for Committee on Research

Nominations for members of the Committee on Research of the A.S.H.V.E. have been made by the council of the society as follows: C. V. Haynes, Philadelphia; W. T. Jones, Boston; J. F. McIntire, Detroit; F. N. Speller, Pittsburgh, and Prof. A. C. Willard, Urbana, Ill. These members will succeed those


CERTIFIED HEATING
Assures Comfort

Certificate

FOR CERTIFIED HEATING INSTALLATION

Certificate No.

Serial No.

This is to Certify that the heating apparatus in the building located at

installed by Specimen

under contract dated was installed in accordance with the Certified Heating Standards adopted by this Association and approved by the Heating and Piping Contractors National Association.

HEATING AND PIPING CONTRACTORS
NEW YORK CITY ASSOCIATION, Inc.

Dated

By

Certificate Given to Owner of a Certified Heating System

whose present terms expire in January, 1930.

As was announced in HEATING AND VENTILATING for August, the nominations for officers of the society for 1930, are:

For president, L. A. Harding, Buffalo, N. Y.; for first vice-president, W. H. Carrier, Newark, N. J.; for second vice-president, Prof. F. C. Rowley, Minneapolis, Minn.; for treasurer, C. W. Farrar, Buffalo, N. Y.; for members of the council (three-year term) R. H. Carpenter, New York; John D. Cassell, Philadelphia; Alfred Kellogg, Boston, and John Howatt, Chicago.

Michigan Chapter Hosts to Past Presidents

Past presidents of the Michigan Chapter of the A.S.H.V.E. were guests of honor at the chapter's opening meeting for the season, held October 14, at the Cadillac Athletic Club in Detroit. There were 85 members and guests present. After calling the meeting to order, President Boales presented Ralph Collamore as master of ceremonies. Mr. Collamore paid a tribute to the late John R. Allen, first president of the Michigan Chapter, for his contributions to the industry, especially as director of the society's Research Laboratory. Among the past presidents who spoke were: J. R. McColl, E. E. McNair, W. B. Johnston, E. M. Harrigan, J. D. Dill, F. W. Johnson, R. S. M. Wilde, J. F. McIntire and W. A. Rowe. Those unable to attend the meeting included F. R. Still, now of New York; William F. Verner, W. C. Harms and N. W. Calvert, who was detained in Chicago. Acting on the suggestion of Mr. Collamore, a silent toast was drunk to the memory of Professor Allen.

L. A. Harding, first vice-president of the A.S.H.V.E. was presented by President Boales. Mr. Harding addressed the meeting on "Power from Process Steam." His talk was illustrated with lantern slides.

Illinois Chapter

At the regular annual meeting of the Illinois Chapter, held at the Sherman Hotel, Chicago, October 14, the national president, Thornton Lewis, spoke of the future of the society. He outlined the value of the research work and the duty of members to carry on the work which has been done in the past. The cooperative work of the Research Laboratory in connection with the Heating and Piping Contractors National Association, the United States Bureau of Mines, and ten technical colleges, was described. President Lewis said that he was amazed while in Europe and Great Britain to find that the engineers in those countries have a greater appreciation of the work done by the Research Laboratory than the American engineers. The French engineers are translating the *Guide* and using it in the University of Paris.

Attendance numbered 73, which is believed to be the largest at any annual chapter meeting of the society. The following officers were elected: President, H. G. Thomas; vice-president, T. H. Monaghan; secretary, C. W. DeLand; treasurer, Carl W. Johnson. E. P. Heckel, M. S. Good and J. H. O'Brien were chosen for the board of governors.

L. J. Pitcher, who won the society's golf trophy for the second time at the summer meeting in Canada, was presented at the meeting.

M. S. Good told of the severe illness of Charles D. Allan, following which the chairman appointed Messrs. Good, Linn and Heckel to prepare an appropriate communication for the chapter, and instructed the secretary to send flowers.

Kansas City Chapter Discusses Gas

Gas, Its Supply, Distribution and Use was the subject for discussion at the opening meeting of the Kansas City Chapter, held at the Ambassador Hotel, Kansas City, September 9. Thirty-one members and guests were present. Messrs. Patten and Koinn, of the Kansas City Gas Company, a subsidiary of the Cities Service Company, presented the subject. Mr. Patten referred to the abundant supply of gas for this section of the country as secured in the large gas sections of Oklahoma and Texas. A graphic description was given of the piping systems connecting the states of Texas, Oklahoma, Missouri and Kansas.

In view of the present increased use of gas as a heating medium in Kansas City, the subject proved of timely interest.

Among the topics scheduled for subsequent meetings of the chapter are: The future of the A.S.H.V.E.; heat losses in connection with test data; power plant equipment for high pressure; air conditioning; The Guide and Research Laboratory of the society and warm-air heating practice.

Philadelphia Chapter's Program

A tentative program has been arranged as follows for the Philadelphia Chapter:

October, moving picture entitled "The Wonders of Anthracite"; November, heating with gas; December, ladies' night; January, annual meeting and election of officers; February, heating with electricity.

Minnesota Chapter Announces Plans for Season

Included in the tentative program outlined for the coming season by the Minnesota Chapter is an inspection trip through the Flax-li-num Insulating Company's plant in November and a discussion of the A.S.H.V.E. Boiler Code in December. The January meeting will be devoted to a discussion of oil burners. Nothing definite has been scheduled for February, but in March copper radiation will be discussed. In April the chapter will visit the Mayo Clinic in Rochester. The May or annual meeting will take the form of an outing.

Michigan Chapter Looks Forward to a Busy Season

Included in the program of the Michigan Chapter for the season of 1929-30, is a discussion of coal, oil and gas at the November meeting, while a Keno party has been scheduled for December. In January the meeting will be devoted to a discussion of the relationship which should exist between the architect, engineer and contractor, the speakers being A. W. Barron, engineer; H. W. Meier, architect, and Fred Johnson, heating and ventilating engineer. In February the chapter will have a Detroit-Edison night. At the April meeting the speakers scheduled are W. H. Carrier, president of the Carrier Engineering Corporation, and C. W. Farrar, president of the Excelso Products Corporation. The May meeting will be given over to the annual election of officers and an outing.

Open House at the Research Laboratory

Officers and members of the society, together with invited guests, attended the Research Laboratory's annual open house at the Bureau of Mines Experiment Station, Pittsburgh, Pa., Nov. 4.

Investigation of Heating Rooms With Direct Steam Radiators Equipped With Enclosures and Shields is the title of a recent University of Illinois bulletin, (Vol. XXVI, No. 42). It appears under the authorship of Prof. Arthur C. Willard, Prof. Alonzo P. Kratz, Maurice F. Fahnestock and Seichi Konzo. In addition to the report of the investigation, the bulletin contains a very complete description, with illustrations, of the low-temperature testing plant at the University of Illinois. (See THE HEATING AND VENTILATING MAGAZINE for March, 1929.) Size 6 in. x 9 in. Pp. 70.

Heating and Piping Contractors National Association

H. & P. C. N. A. and A. G. A. Agree on Sales Principles

Heating and Piping Contractors National Association and the American Gas Association have approved the following principles of merchandising central plant heating equipment.

The statement of principles, which has been executed by the officers of the two associations, and which is expected to stimulate the sale of these appliances, reads:

Since gas appliance sales and gas sales are so closely related and so dependent on each other, and

Since the service rendered by the appliance to the gas customer is what the customer is ultimately paying for, and

Since the proper appliance for a specific service, the correct and safe installation of the appliance, the proper customer instruction in the correct use of the appliance and a speedy service for repair and maintenance of the appliance are necessary factors in every gas appliance sale to a gas utility customer,

First, Manufacturers of gas appliances, dealers in gas appliances, the gas utility and the gas customer will more largely benefit by the gas utility extending its policy of merchandising gas appliances to encourage greater sales by trades.

Second, The margin on all gas appliances sold by the gas utility should be sufficient to cover all merchandising costs incurred, and thus enable progressive retail trades to merchandise gas appliances at a reasonable profit. It is recognized, however, that certain expenses incurred in the pioneering of appliances which have not yet met with sufficient local public acceptance to be generally accepted as merchandise items, should properly be charged to the promotion accounts of the utilities and not charged to merchandising.

Third, All local sales efforts by gas utilities and trades should be based on the merchandising of those appliances which conform to standards established by specialists of the United States Bureau of Mines, United States Public Health Service, United States Bureau of Standards and the American Gas Association as outlined in bulletins which may be obtained through the American Gas Association.

The associations concerned recommend to individual gas companies and trades, the advisability and the necessity of greater sales activities in local fields for the ultimate purpose of increasing the sale of gas appliances and of promoting the proper use of gas, and

Further recommend that proper and adequate service to the ultimate gas consumer be recognized as essential to all progressive sales efforts.

Heating and Piping Contractors National Association.
By WALTER KLIE, President.
American Gas Association,
By ALEXANDER FORWARD, Managing Director.

Cleveland Contractors Conduct Radiator Heating Sales School

Fostered by the Heating and Piping Contractors Cleveland Association, the Radiator Heating Sales School was opened at the Hotel Statler, Cleveland, September 9. Sixty contractors, salesmen and jobbers were present. B. Y. Kinzey, manager of the association and instructor of the school, was introduced by Walter Klie, president of the H. & P.C.N.A. and chairman of the Cleveland Trade Promotion Committee.

Mr. Kinzey stated that 85% of the new one- and two-family residences built in Cleveland in 1928, were equipped with warm-air furnaces, but that this had been reduced to 75% in 1929.

C. E. Redfield, of the American Radiator Company was the guest speaker of the evening.

Zink Reports on Welding

At the board of directors' meeting of the Heating and Piping Contractors National Association, held in Louisville, Ky., October 15-16, at the Brown Hotel, John H. Zink, of Baltimore, chairman of the sub committee on welding, reported on the work of his committee, and the cooperation it has been receiving from manufacturers of oxyacetylene equipment. The Air Reduction Sales Company and the Linde Air Products Company have made it possible for the committee to come to the board with a plan for setting up an educational department whose primary interest will be the compilation and publication of the Welding Manual. The board of directors authorized the establishment of such a department and the employment of a director for it.

Mr. Zink was elected a member of the board of directors to fill the vacancy caused by the death of Horace W. Jones.

New Clubhouse for St. Louis Heating and Piping Contractors

The Heating and Piping Contractors St. Louis Association is now located in its new home in a three-story and basement house, located at 3626 West Pine Blvd., St. Louis, Mo., which cost $50,000. In addition to offices and a large meeting room which also can be used for social affairs, there is a billiard room, card room, lounge, library, grill and valet service. Officers of the association are: President, J. E. Strong; vice-president, E. P. Ambler; treasurer, L. W. Moon; secretary, H. P. Materne.

Artificially Drying New Buildings by Blowing Heated Air Under High Pressure by Powerful Fans

Power Show Exhibitors

AMONG the 400 exhibitors at the forthcoming Power Show at the Grand Central Palace in New York, December 2-7, are the following:

Absolute Con-Tac-Tor Corp., Elkhart, Ind., oil-burner, coal-burner and unit heater controls, and mercury switches.

Aerofin Corporation, Newark, N. J., Aerofin heating surface.

Alexander Bros. Inc., Philadelphia, Pa., Tentacular transmission belt.

Allen & Billmyre Co., Inc., New York, multi-stage turbo-blower and single-stage blowers.

Allen-Bradley Co., Milwaukee, Wis., switches and controls.

American Blower Corp., Detroit, Mich., fans, blowers and unit heaters.

American Radiator Co., New York, controls for temperature, pressure and fuel control and valves.

American Schaeffer & Budenberg Company, Brooklyn, N. Y., indicating and recording instruments.

Ames Pump Co. Inc., New York, vacuum heating pumps and condensation pumps.

Armstrong Cork & Insulation Co., Pittsburgh, Pa., heat insulating material for high-temperature equipment.

Armstrong Machine Works, Three Rivers, Mich., full line of traps.

E. B. Badger & Sons Co., Boston, Mass., expansion joints and copper boilers.

Bristol Co., Waterbury, Conn., recording pressure and vacuum gauges, recording barometers, thermometers, pyrometers and electrical control instruments.

Brown Instrument Co., Philadelphia, Pa., recording and resistance thermometers and pressure gauges.

Bryan Boiler Co., Greenwich, Conn., heating boilers.

Builders Iron Foundry, Providence, R. I., diaphragm meters and shunt meters for steam, air and gas.

A. M. Byers Co., Pittsburgh, Pa., new processes for welding joints.

Carrier Engineering Corp., Newark, N. J., unit air conditioners, home air conditioners, drying and processing equipment.

Carrier-Lyle Corp., gas-fired warm-air heaters.

A. W. Cash Co., Decatur, Ill., pressure-reducing and regulating valves.

Century Electric Co., St. Louis, Mo., motors.

Consolidated Ashcroft Hancock Co., Bridgeport, Conn., gauges, thermometers, and recording instruments.

W. B. Connor Co., Inc., New York, steam traps and condensate handling equipment.

Cooper-Hewitt Electric Co., Hoboken, N. J., mercury tube switches.

Crane Company, Chicago, power and heating specialties.

De Bothezat Impeller Co , Inc., New York, demonstration of air flow phenomena around fan blades.

Detroit Stoker Co., Detroit, Mich., stokers.

Joseph Dixon Crucible Co., Jersey City, N. J., joint compound flake graphite and graphite greases.

Domestic Stoker Co., New York, stoker in full operation showing how coal automatically is fed to the fire, and a small hot water heating unit with thermostatic control.

Domestic Engineering, Chicago, Ill.

C. A. Dunham Co., Chicago, Ill., Dunham differential vacuum heating system operating unit.

Duriron Co., Inc., Dayton, O., pumps, fans, valves and fittings for handling corrosive fluids.

Ellison Draft Gauge Co., Chicago, Ill., draft gauges, pitot tubes and calorimeters.

Erie City Iron Works, Erie, Pa., boilers.

Farnsworth Company, Conshohocken, Pa., condensation receivers, boiler feeders and steam traps.

Federal Gauge Co., Chicago, Ill., Mercoid controls.

Fitzgibbons Boiler Co., Inc., New York, steel boilers.

O. E. Frank Heater & Engineering Co., Inc., Buffalo, N. Y., oil cooler.

The Foxboro Co., Foxboro, Mass., indicating and recording instruments.

General Electric Co., Schenectady, N. Y., industrial equipment.

General Stoker Corp., New York, automatic underfeed coal burner.

Gillis & Geoghegan, Inc., New York, ash-removal equipment.

Grinnell Co., Inc., Providence, R. I., pipe bends, lap joints and pipe hangers.

Hoffman Specialty Co., Inc., Waterbury, Conn., working and open samples of venting valves and controlled heat specialties.

Paul B. Huyette Co., Inc., Philadelphia, Pa., laboratory instruments and flue gas analyzers.

Ilg Electric Ventilating Co., Chicago, Ill., unit heaters and blowers.

Illinois Engineering Co., Chicago, Ill., zone heat control and heating specialties.

Jenkins Bros., New York, valves.

Johns-Manville Corp., New York, insulations, packings, building materials.

E. F. Keating Pipe Bending & Supply Co., New York, joints, pipe bends, welded heaters and coils of various types.

Kieley & Mueller, Inc., New York, steam specialties.

Korfund Co., Inc., New York, sound-deadening materials.

Leeds & Northrup Co., Philadelphia, Pa., combustion control equipment, recorders, etc.

Linde Air Products Co., New York, complete line of equipment for oxy-acetylene welding and cutting.

Liquidometer Corp., Long Island City, N. Y., distance-reading liquid level tank gauges and direct-reading gauges.

Mayflower Oil Burner Corp., West New York, N. J., oil burners.

Mercoid Corp., Chicago, Ill., Mercoid combination low-water cut-off and pressure control, controls for oil burners, boilers and furnaces.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., thermostatic controls, valves, etc.

Midwest Air Filters, Inc., Bradford, Pa., air filters.

Nash Engineering Co., South Norwalk, Conn., vacuum and condensation pumps, compressors.

National Regulator Co., Chicago, damper regulators and heat control systems.

National Tube Co., Pittsburgh, Pa., copper-steel pipe.

Parker Appliance Co., Cleveland, O., tube couplings and fittings.

Wm. Powell Co., Cincinnati, O., complete line of valves.

Powers Regulator Co., Chicago, Ill., automatic temperature control equipment, thermostatic water controllers.

W. S. Ray Mfg. Co., San Francisco, Calif., oil burners.

Reeves Pulley Co. of N. Y., Inc., New York, variable speed transmission.

Rome Brass Radiator Corp., New York, Robras electric steam radiators and metal enclosures.

Sarco Co., Inc., New York, steam traps, temperature regulators and air eliminators.

Schutte & Koerting Co., Philadelphia, Pa., jet appliances for handling fluids and light weight heating surface.

Spencer Turbine Co., Hartford, Conn., turbo compressors for oil and gas burners.

Swartwout Co., Cleveland, O., ventilators, steam, oil and air separators, high and low-pressure traps.

Sweet & Doyle Foundry and Machine Co., Troy, N. Y., house-heating equipment.

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., instruments for power plants, round form recorders and automatic controllers.

Taylor Instrument Companies, Rochester, N. Y., indicating and recording thermometers, recording pressure gauges.

Time-O-Stat Controls Co., Elkhart, Ind., automatic controls.

Trane Co., La Crosse, Wis., bellows packless valves, bellows radiator traps, vents and strainers.

Tube-Turns, Inc., Louisville, Ky., pipe fittings.

Universal Humidifier Corp., Philadelphia, Pa., humidifiers.

Warren Webster & Co., Camden, N. J., steam heating systems and specialties.

Watts Regulator Co., Lawrence, Mass., valves, regulators, and steam specialties.

Webster Tallmadge Co., Inc., New York, electric heat controls and heating apparatus.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., electric motors.

L. J. Wing Mfg. Co., New York, fans, blowers and unit heaters.

Wright-Austin Co., Detroit, Mich., steam and oil specialties.

"X" Laboratories, New York, "X" boiler liquid.

Later Additions

American Brass Co., Waterbury, Conn.

Cochrane Corp., Philadelphia, Pa.

Fire King Stoker Co., Indianapolis, Ind.

Hartzell Propeller Co., Piqua, O.

Howell Electric Motors Co., Howell, Mich.

Mason Regulator Co., Dorchester Center, Boston, Mass.

Preferred Utilities Co., Inc., 33 West 60th St., New York.

Scovill Mfg. Co., Waterbury, Conn.

H. O. Trerice Co., Detroit, Mich.

While there will be no special section devoted to heating and ventilating, the industry will be well represented by displays of equipment used in conjunction with power installations.

This Type of Architecture in Dornach, Germany, Imitates the Growth of Flowers and Plants

Oil-Burner Sales Reach Peak in August

August shipments of oil burners, as reported by fifty manufacturers whose output constituted 60% of the total for the industry in 1927, amounted to 10,663 as compared with 6520 in July. New orders, shipments, stocks and unfilled orders are given below for each of the first eight months of the current year, detailed figures by classes being shown for the month of August.

SUMMARY OF OIL BURNERS

		Shipments		
1929	Total	U. S.	Canada	Foreign
January	3,037	2,923	20	94
February	3,113	3,039	25	49
March	4,137	3,983	66	88
April	3,903	3,750	67	86
May	4,474	4,305	39	130
June	5,146	4,966	79	101
July	6,520	6,298	112	110
August	10,663	10,385	146	132
Total (8 mos.)	40,993	39,649	554	790
Domestic				
Mechanical Draft	8,034	7,839	103	92
Natural Draft	1,513	1,504	9	—
Industrial				
Mechanical Draft	1,091	1,017	34	40
Natural Draft	25	25	—	—
Total (8 mos.)	10,663	10,385	146	132

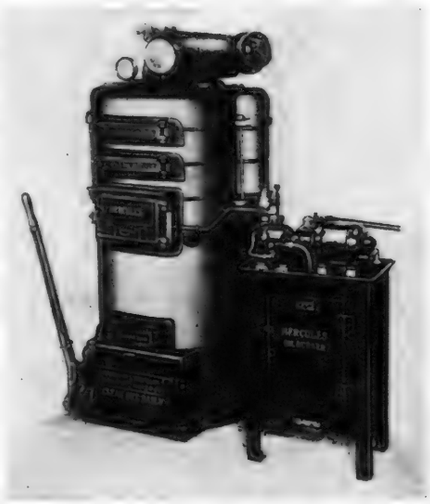
Heating Industry Contributes to Transportation Engineering

Three companies engaged in the manufacture of products used in heating industry have helped make possible a new type of switch engine built recently. The engine, placed in service last month in the metropolitan district of New York by one of the large eastern railroads, is equipped with an 8-cylinder gasoline engine which drives a direct-current generator. The generator supplies direct current motors which are connected to the driving wheels, so that no mechanical transmission problems are encountered.

Ten Rome-Turney radiators are placed horizontally on the roof. Nine of these are used to cool the cooling water for the gasoline engine, while the other is used to cool the lubricating oil. The cooling water system is equipped with a Crane steam relief valve, adapted for the purpose of supplying a safety valve for the system.

An Arcola boiler in the cab on the front of the locomotive serves two purposes. Heat for the cab is supplied by the surface of the boiler, and the piping from the Arcola is connected to the cooling water system, so that in cold weather the cooling water can be kept warm while the locomotive is idle. The Arcola constitutes the only coal-burning appliance on the locomotive.

Designed to eliminate the smoke nuisance, the new engine will pu'l as many as twenty loaded freight cars.



Hercules Oil Burner Sold by Sears-Roebuck

Mail Order House Sells Oil Burners

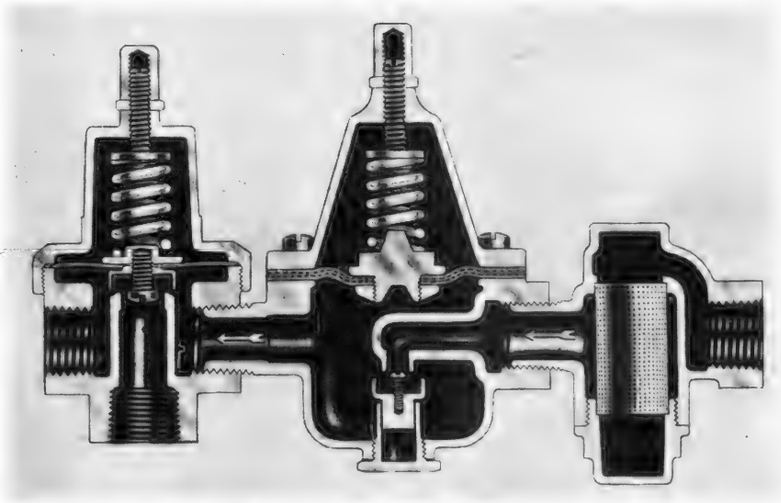
Sears, Roebuck Company, nationally known Chicago mail order house, will sell the Hercules oil burner through its Boston retail office. This burner is known as the Gill in other parts of the country. Fifteen salesmen, with a quota of 200 burners for the year, have been placed in the field. Installation of burners sold and their service during this year will be handled by the Oil Burner Service Company of Boston.

National Fire Protection Association Year Book, containing the membership directory, as well as the articles of association, officers and committees for the year 1929 and 1930, has been issued by the association from its executive offices in Boston. The membership directory is revised to August 9, 1929.

65-Ton Gasoline Electric Switching Locomotive in Service at New York

Present Practice in Water Heating

V. Watts Unit



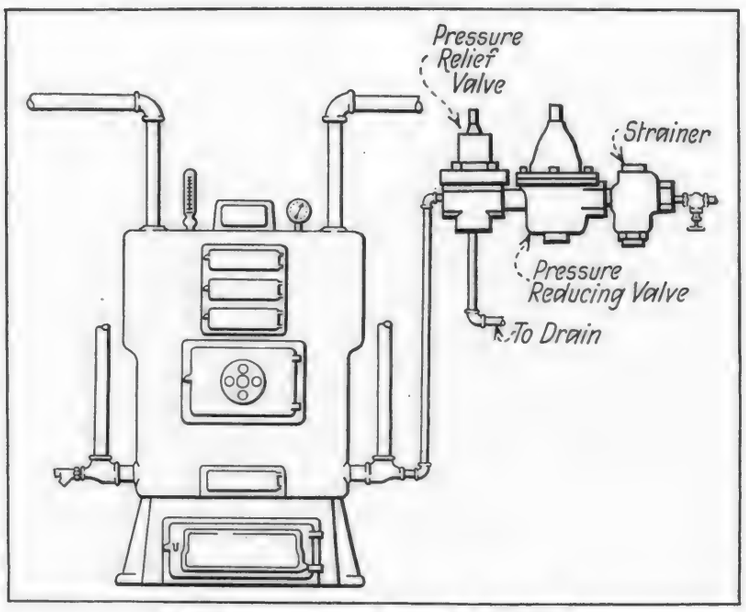
Sectional View of Watts Unit

CONSISTING of a strainer, a water pressure reducing valve and a pressure relief valve, the Watts Unit is designed to make a hot water heating system automatic. Since by building up the pressure in a closed system we are able to obtain a greater speed of circulation than in an open system, the closed system is more economical to operate than an open system. This is because the faster the water travels over a heated surface, the more heat per unit of fuel it will absorb. Increasing the speed of circulation forces the heat to the last radiator in the line more quickly, and does away with the sluggish radiator. The Watts Unit, made by the Watts Regulator Co., Lawrence, Mass., automatically keeps the system full of water at all times by adding water as it is needed.

Made of navy bronze, the Watts relief valve has a three-ply laminated phosphor-bronze diaphragm which is attached to a Jenkins disc by means of a water-tight threaded brass cap and brass screw. The valve has a full half-inch waterway, and the diaphragm and disc are on the top of the valve away from the flow of water, so that any dirt which may get in the valve cannot clog up the disc or diaphragm. The relief valve is set so that it will drip slightly at 27 lbs. pressure and give positive relief at 30 lbs. pressure. It is equipped with a seal cap over a slotted adjustment screw. There is a safety port in the valve which shows a leakage of water if there is anything wrong with the valve.

The pressure reducing valve, which prevents the full water line pressure from being carried into the boiler, has a rubber diaphragm with a canvas insert. It is stated by the manufacturer that when rubber is submerged in water it lasts practically indefinitely, and that replacements on this diaphragm over a period of 15 years have been practically negligible. The reducing valve is set to reduce the water pressure from 100 lbs. to 13 lbs. Any change of 50 lbs. in the initial pressure means a corresponding change in the reduced pressure of 3 lbs. In other words, 50 lbs. inlet pressure gives a reduced pressure of 10 lbs., and 150 lbs. inlet pressure will be reduced to 16 lbs. This valve is equipped with a seal cap over a slotted adjustment screw. Adjustment is necessary only when the installation is more than three stories in height, or when the water pressure is extremely low.

The third device making up the unit is the strainer, which is so constructed that the water passes into the strainer and down inside of the screen. It then passes from the inside of the screen through the screen and on into the reducing valve. In the bottom of the strainer is a plug for cleaning of the strainer.



Boiler Connections Showing Watts Unit

Popularity of Welding School

The welding school opened last winter by the Chicago local of the Steam Fitters Protective Association for the benefit of its members has proven so popular that it was decided to reopen it for the coming season. Under the direction of E. D. Benton and Guy Guthrie, instruction is given in the use of the oxy-acetylene welding and cutting torches. Classes meet at the Washburne School four nights a week, starting early in September, and will continue until late in the spring.

New Apparatus and Appliances

Van Dorn-Flex Disc Grinder

A 7-in. Flex-Disc grinder for smoothing welded and soldered joints and seams, cleaning dies, smoothing metal surfaces before painting and any other work requiring filing, sanding and emerying, has been announced by the Van Dorn Electric Tool Co., Cleveland, O.

It has ample power and, with the use of a felt backed abrasive disc, it is said to handle these operations quickly and satisfactorily.

Improvements made on the 7-in. grinder have been included on the present

Disc Grinder for Smoothing Welded Joints

9-in. grinder. These include a removable pipe handle and right- and left-hand bosses, making it possible quickly and easily to change the grinders for right- or left-hand operation.

Lincoln Gas Engine-Driven Welder

A gas engine-driven welder for use where electric power is not available has recently been introduced to the trade by the Lincoln Electric Co., Cleveland, O. The new welder is of 200 amperes N.E.M.A. rating and is powered by a 4-cylinder Waukesha engine, operating at 1500 R.P.M.

An automatic idling device is incorporated which automatically reduces the speed of the gas engine when welding operations cease and automatically accelerates the engine to proper speed as soon as welding is started. The manufacturer states that this automatic idling device will reduce fuel consumption approximately 25%, as well as considerably reducing wear in the welder so as to permit longer life of the equipment.

Another feature of this welder is the complete protection afforded the machinery by the welded steel canopy which totally encloses the outfit.

Unified control is also incorporated in this new model. Operating controls are enclosed in a ventilated steel cabinet.

Krusair Air Conditioning Unit

An oil-burning unit for cleaning, circulating, warming and humidifying the air in the home, has been brought out by the Kruse Co., Indianapolis, Ind.

Air supplied to the unit is first subjected to a cleansing by the air filter, through which it passes to a pressure blower. An oil-burning heater, built of heavy copper-bearing steel, heats the air to the proper dry-bulb temperature, following which it is properly humidified and distributed through ducts to the various rooms.

The casing is made in sections approximately 1 in. thick, the inner wall being of galvanized steel and the outer wall of black steel. Four layers of ¼ in. air cell asbestos are used as an insulating filler. The casing is finished in old ivory duco with blue trimmings. All parts subjected to heat are enameled.

These units are available in four sizes, with capacities from 120,000 to 324,000 B.T.U. per hr.

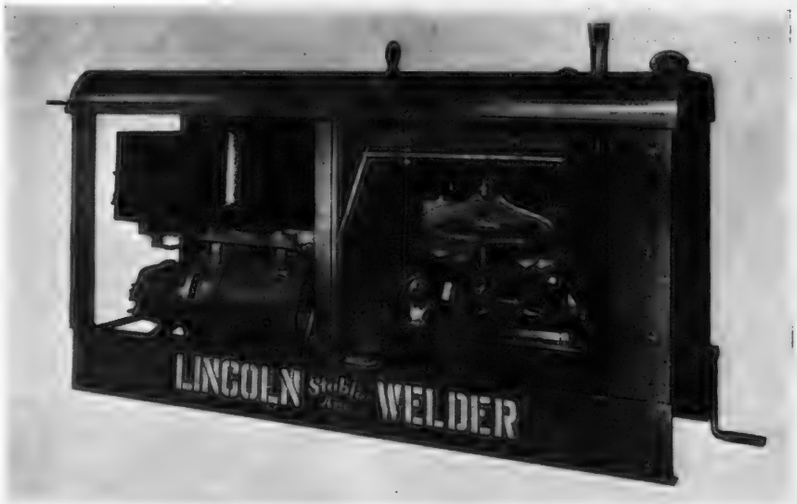
Dole Triple-Action Vacuum Valve

A triple-action Dole vacuum valve, No. 2-B, for one-pipe steam heating systems, is announced by the Dole Valve Co., 1913-1933 Carroll Ave., Chicago, Ill.

It differs from ordinary vacuum valves in that it seals the steam through the

Dole Vacuum Valve

combined action of a thermostatic float, a vacuum primer and a bellows. When steam enters the radiator, air is eliminated through the vents; the float operates a positive shut-off when the thermostatic diaphragm expands. The vacuum is created when the steam pressure decreases, at which time the vacuum primer operates. The primer temporarily shuts off the vent openings and by doing so starts the vacuum. Due to the difference between the pressure inside the valve and atmospheric pressure, the bellows operates instantly and automatically contracts—shortening its length. In doing so it forms a permanent seal on the post stem. This seals the steam so that the radiator will stay hot for many hours after the fire is banked. The valve is equally efficient on steady or intermittent venting. When the fire goes down the vacuum is definitely held, permitting steam to enter quickly and without resistance, even at low, economical temperatures.



Gasoline Engine Driven Welding Machine

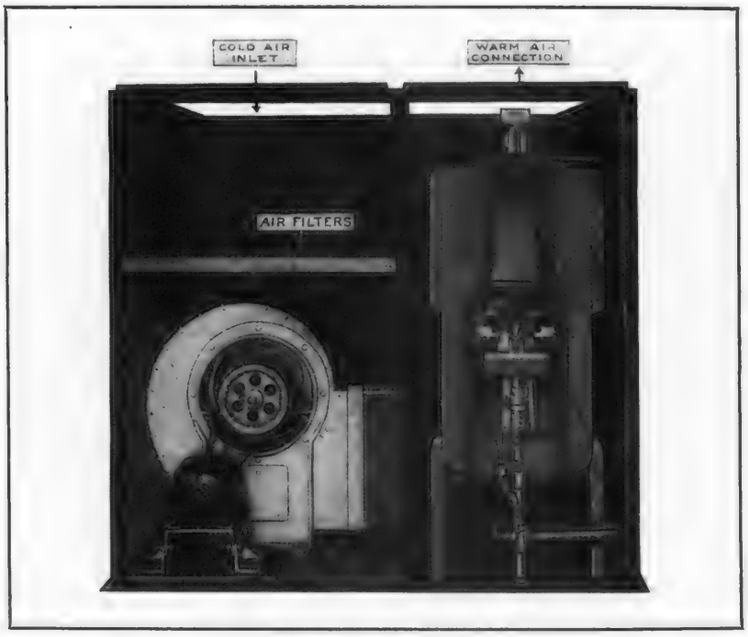
Williams Oil-O-Matic Junior Oil Burner

Oil-O-Matic Model JR, designed to function on the same principles as do the Models G and J, and to burn the same grades of fuel oil, has been announced by the Williams Oil-O-Matic Heating Corp, Bloomington, Ill.

Power for the Junior model is delivered by a trunnion-mounted motor operating at 1750 R.P.M. and rated at 1/6 H.P. The motor is concealed in a housing readily accessible, and the housing is in turn attached directly to the fan housing, providing a compact unit. Beyond the fan is placed a flexible coupling for driving the mechanism which includes the atomizing pump and metering pump.

The motor housing is a self-contained unit for ignition control oil valve and safety control box. The opposite side of the burner is made up of an integral unit composed of the atomizing pump, metering pump and the air intake cone. Control of secondary air is obtained through the side of the fan housing, which has two pressed steel cones readily adjustable. The metering pump adjusting dial is orange colored to identify the burner.

Control, aside from the oil valve and ignition, is provided through a Heat Unit operating in conjunction with a stack safety. Where it is desired, the burner can be operated in conjunction with a clock thermostat, but the clock thermostat equipment will operate only on low voltage through a relay. The burner can be equipped to operate either directly from a gravity tank in the basement or from a pump set located within the basement and connected with an outside storage tank.



Interior of Juneair Weathermatic

Juneair Weathermatic

Designed for houses having from six to thirty rooms, a gas-fired warm-air furnace with humidifier and filters has been introduced by the American Foundry and Furnace Co., Bloomington, Ill. The furnace is constructed in two major parts, each consisting of a cored casting. These two castings, when faced together, form two joints—one at the top and one at the bottom, running lengthwise. Lap joints at both top and bottom clasp the furnace cement and asbestos packing rigidly. A retaining wall is constructed around the joint in the bottom of the furnace so that there is no chance of any moisture coming in contact with the furnace cement. Condensation drains down the tubes to the bottom of the furnace and thence into a discharge pipe to the sewer.

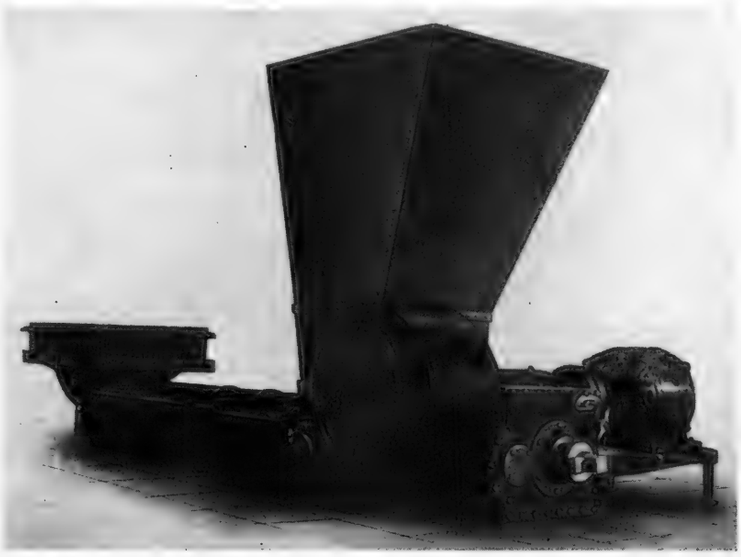
Burners are placed near the top instead of at the base, thus creating the highest temperature at the upper portion. The cold air entering the furnace at the base is gradually heated as it ascends and, when the top is reached, it is at the maximum temperature.

In the upper section, the products of combustion first travel up to the top of the furnace castings. They then divide, turn and flow downward to the bottom through a hollow tube on both sides. They again turn upward into the breeching and flow back through the breeching to the flue connection at the rear where they are discharged into the flue pipe. Both the primary and secondary air for combustion enters the combustion chamber through a grill and at the rear of the furnace through a similar opening. As the air passes upwards to the burner tips, it extracts heat from the hot surface of the breeching and the inner sides of the flues. Thus, the air is pre-heated before mixing with the gas.

Humidity is controlled by turning a small handle which regulates the area of the exposed water surface in the pan.

Safe operation is provided by a safety pilot. If for any reason, the gas pilot is extinguished, the main valve is closed and no gas can escape into the furnace. Air filters are provided which remove dust and dirt.

The unit is finished in white vitreous enamel in the front, white duco on the sides, and green trimmings. A blower furnishes forced circulation.



Mechanical Fireman, Commercial Size Stoker Described in Last Month's Issue

Mr. Fred Hume, *a Director, and Manager of Machinery and Motive Power, of* THE INTERNATIONAL SHOE CO.—

Architects
TRUEBLOOD & GRAF
St. Louis, Mo.

Heating Contractor
EICHLER HEATING CO.
St. Louis, Mo.

equipped his residence with POWERS Control

. . . GUIDED by the Accurate and Dependable control secured with Powers apparatus in many of the 43 Shoe Factories, 14 Tanneries, and 61 Auxiliary Plants of the International Shoe Co., Mr. Hume selected the Powers System of Temperature Control for the fine residence he recently built in St. Louis.

While the first cost of Powers Control is usually higher, its longer life and dependable service make it cost much less in the end.

The Powers Vapor Disc Thermostat
It costs more. It's worth more! Because it often gives 15 to 20 years of accurate control without repairs of any kind.

THE POWERS REGULATOR CO.
35 Years of Specialization in Temperature Control
Chicago: 2718 Greenview Avenue • *Offices in 35 Other Cities* • New York: 137 East 46th Street
The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

POWERS

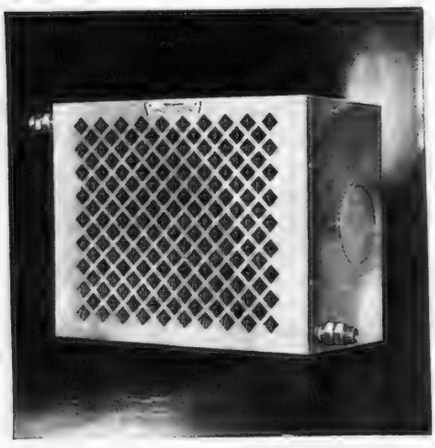
Speed Unit Heaters

A line of Speed unit heaters has been announced by the B. F. Sturtevant Co., Hyde Park, Boston, Mass. These are available in Type 1 and Type 2 for industrial uses, and in a cabinet heater, which is somewhat smaller than the speed heaters, equipped with a grille.

Industrial Type Speed Heater

Types 1 and 2 can be hung from ceilings, beams, trusses, columns or walls. The hangers provided are of cold rolled steel, which can be formed in a vise to fit existing conditions. The hangers for the cabinet heater are simple angle irons, conveniently drilled. All models are equipped with high pressure Aerofin.

Based on 2 lbs. steam pressure and a 52° temperature rise, the capacity of the No. 1 heater is over 1000 cu. ft. per min., when running at 750 R.P.M. At 950 R.P.M. and a 47° temperature rise, the same heater has a capacity of 1268 cu. ft. per min. No. 2 has a capacity of 2160 cu. ft. per min. at 870 R.P.M., with a temperature rise of 76°, while at 1170 R.P.M. the capacity is 2740 cu. ft. per min. with a temperature rise of 70°. The cabinet heater has a capacity of 602 C.F.M., with a 67° temperature rise when running at 500 R.P.M., and a capacity of 852 C.F.M., with a 53° temperature rise at 725 R.P.M.



Cabinet Type Speed Heater

New Trade Publications

The Quality Metals of Industry, Monel, copper, nickel, brass and bronze, is the title of a catalog issued by the Whitehead Metal Products Co., 304 Hudson St., New York. All types of wires, rods, bolts, nuts, pipe and other forms made in these metals are described in detail. Several pages are devoted to wire cloth, such as is used in ventilator grilles, radiator covers, etc. Size 6 in. by 9¼ in. Pp. 286.

"It's Your Move," is the caption appearing on a folder received from the Swartwout Co., 18511 Euclid Ave., Cleveland, O. Photographs of this company's steam trap, sediment trap, oil separators, pressure valves, return trap, feed pump governors, etc., are included.

"Where Is It," is the question asked on a broadside received from the Super Oil Heator Co., Pawtucket, R. I. An illustration shows a home-owner being asked that question in regard to the Super Oil Heator, which cannot be seen in the owner's boiler. The answer is "It's all in the furnace, entirely out of sight." A supposed conversation takes place between the home-owner and his acquaintances with the home-owner telling of the advantages of the Super Oil Heator.

Sprayo-Flake Insulation, Technical Data and Specifications, appears on the cover of an 8-page circular issued by the Sprayo-Flake Co., 56 South Bay St., Milwaukee, Wis. The Sprayo-Flake insulating process consists of forcing prepared flakes of fibrous material, previously impregnated with a fire resisting agent, by air through a specially constructed gun, and the material can be applied to almost any surface in any desired thickness. The thermal conductivity is 0.25 B.T.U. per hr. per sq. ft. per in. thickness per degree temperature differential.

The folder contains data from tests made by Rowley at Minnesota, Peebles at Armour Tech, and Lewis of Chicago, and shows various types of wall construction together with their heat loss coefficients. Detailed instructions are given for calculating heat losses using various types of construction, and specifications are presented to cover application of Sprayo-Flake.

Thermal Unit Heaters are featured in a catalog of the Thermal Unit Co., Pershing Road and Loomis St., Chicago. The heating elements in these units are of cast aluminum made in one piece without joints, welds, flanges, or brazed or soldered connections. They are tested to withstand operating pressure up to 250 lbs. The armatures, connections and wiring of the motor are all protected against exposure to chemical elements which are frequently found in many factories and which tend to produce corrosion. The electric fan is of four-blade aluminum construction firmly riveted to the hub axle. A list of the many applications of unit heaters, including ventilation, drying and refrigeration, is given.

The units are made in three sizes: No. 12, No. 20 and No. 30, which, with intake air temperature of 50° and 1 lb. steam pressure, have capacities ranging from 164 to 1172 sq. ft. of equivalent direct radiation. Size 8½ in. x 11. Pp. 16.

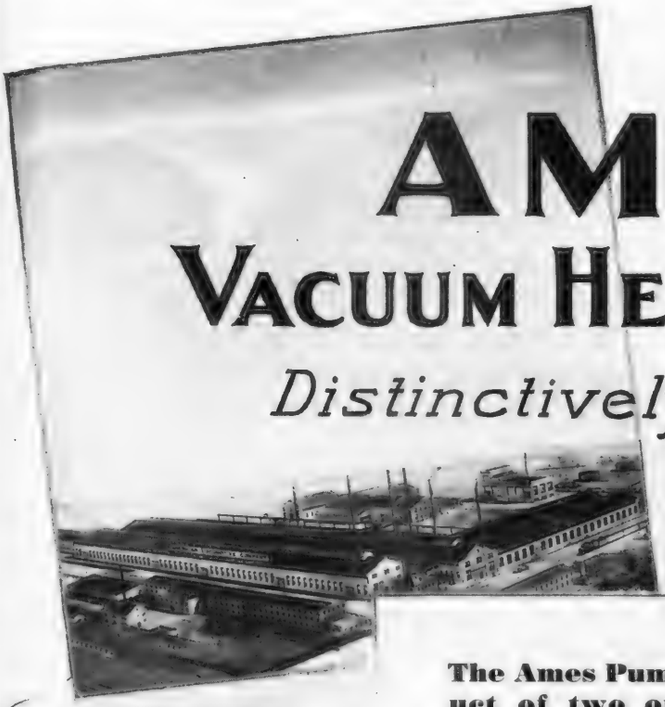
The Power System of Remote Control for diaphragm valve dampers described in a folder received from Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill. The Powers pneumatic switch can be used to control inaccessible diaphragm valves and damper motors by means of compressed air which is piped to the switch and from switch to the valve or damper to be controlled. Where many of these switches are installed a panel or switchboard made of slate can be used. The all metal diaphragm valve made by this company has an all metal "everlasting" bellows.

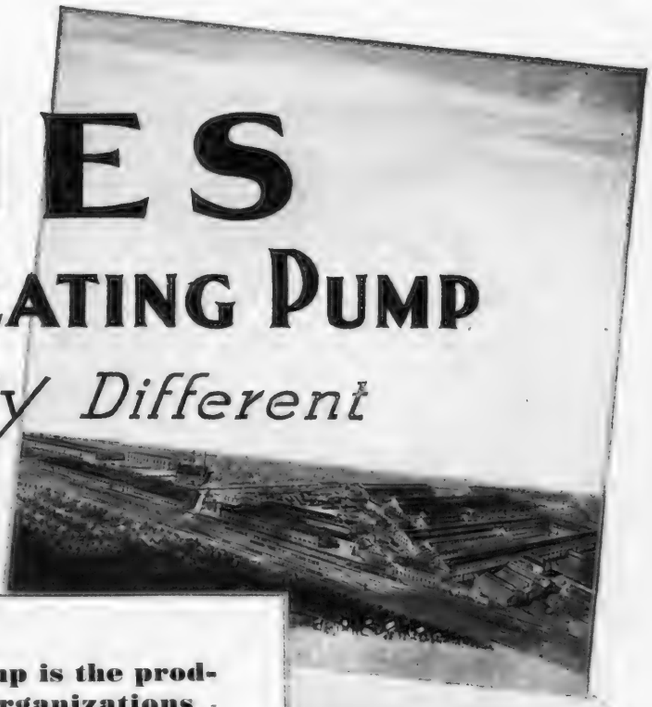
Dampers are built in all sizes and shapes: single, louver, mixing and round. Dampers can be supplied with or without damper motor mounting. The folder shows a typical layout of an installation in which the Powers pneumatic switch is used.

American Blower Electric Ventilation Peps Up Workers is the statement made on a broadside received from the American Blower Corp., Detroit, Mich. Numerous illustrations show installations of Ventura ventilators installed in manufacturing plants, forge shops, grinding departments, and other types of rooms or buildings where electric ventilation is necessary.

Operation and Care of the Master Heat Regulator, a book of special instructions for the users of this device, has been published by the White Mfg. Co., St. Paul, Minn. Detailed information about the construction is given in connection with sectional drawings and illustrations showing interior views of the thermostat and regulator. Instructions providing for almost every possibility which may arise in connection with the use of these devices include information on setting the clock, setting the timing disc, checking the thermostat adjustment, removing the clock, and cleaning the contacts.

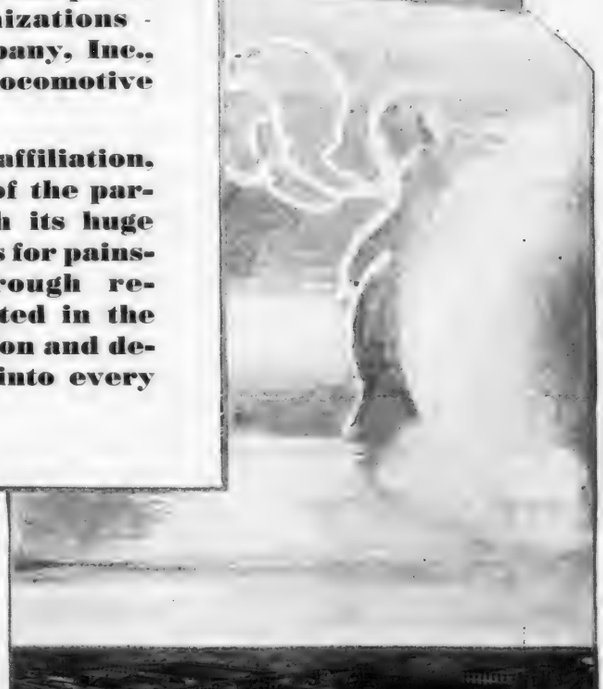
AMES
VACUUM HEATING PUMP
Distinctively Different

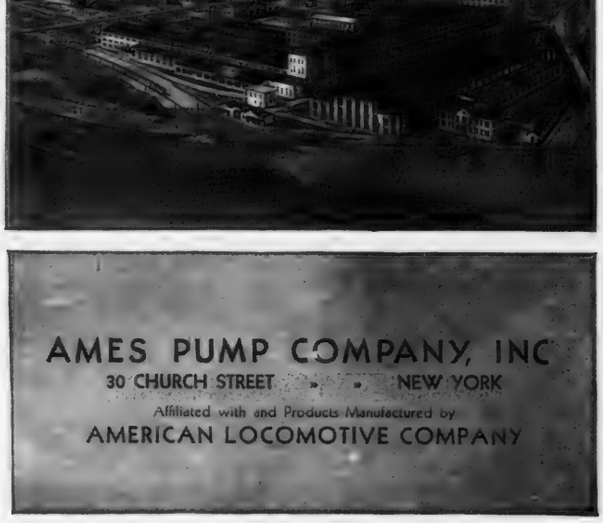




The Ames Pump is the product of two organizations - Ames Pump Company, Inc., and American Locomotive Company.

Because of this affiliation, all the resources of the parent company, with its huge shops and facilities for painstaking and thorough research, are reflected in the locomotive precision and dependability built into every Ames Pump.





AMES PUMP COMPANY, INC
30 CHURCH STREET • • NEW YORK
Affiliated with and Products Manufactured by
AMERICAN LOCOMOTIVE COMPANY

Thermoflex Heating Specialties for vapor and vacuum heating systems is the subject of Bulletin 52, issued by the W. D. Cashin Co., 35 Hartford Street, Boston, Mass. Various types of Thermoflex valves, traps, feeders, and alternators are presented and shown photographically. Typical details of boiler-feed connections are sketched. A feature of the company's Thermoflex-Hydron trap is the thermostatic bellows made by a process which requires several hundred pounds internal hydraulic pressure. In this way each bellows automatically is tested before formation, thus assuring a self-test. Broken-away photographs show the use of the bellows in typical traps. Size 8 in. by 10¾ in. Pp. 16.

Webster Moderator System of Steam Heating is presented in a new folder issued by Warren Webster & Co., Camden, N. J. This system varies the quantity of steam delivered to the building as a whole and to each radiator in particular, balancing the supply of heat with every change of outside temperature and inside demand. If certain radiators are shut off, the system is designed automatically to alter the supply of steam to the remaining radiators to correct for the change in demand. If firing is uneven provision is made for ironing out the resulting variations in the steam supply. The system is adaptable to buildings requiring approximately 10,000 sq. ft. or more of radiation.

Young Unit Heaters are described in Bulletin H-429, published by the Young Radiator Co., Racine, Wis. In the bulletin are outlined the advantages of heating with unit heaters, together with a description of the various units made by the company. Engineering data in regard to capacity, steam and sizes are shown on the table. One of the latest developments of the Young unit heater is the application of the unit in a recirculating box for floor mounting.

"Ten Thousand Satisfied Users," is the caption on a broadside received from the New York Blower Co., Chicago, Ill. pressed spruce fibers. Features of the The folder contains photographs of typical installations of New York Blower products and lists a large number of users of the various devices manufactured by this company.

Heating Rates for 1928-1929 have been compiled by the Ric-wiL Co., Union Trust Bldg., Cleveland, and are presented in a handy folder issued by the company. The list includes rates charged by district heating companies in cities throughout the country for steam and water heating. In addition there is a group of five sketches showing Ric-wiL constructional details of district heating pipe coverings. Size 8½ in. by 11 in. Pp. 6.

Calculation of Heat Losses around wall openings is the subject of a handbook compiled by the Structural Service Bureau, Philadelphia, in collaboration with the Chambers Metal Weather Strip Co., Detroit. Comprehensive data are included regarding the purpose and value of weatherstripping. A four-page, composite table of B.T.U. losses for woodsliding windows is a feature of the handbook. The table covers tests on plain window, including glass, and weatherstripped window, including glass. Computations include total square feet of openings and perimeters. Other tables give leakage figures on single doors, with and without metal stripping, and similar data regarding wood-casement windows and double swinging-in casement windows. Correction tables for wind velocity, climatic conditions for ninety American cities, and temperature are supplied. Size 6 in. by 9 in.

Wagner Transformer Oil, including specifications originally prepared for its own organization only, but recently released for transformer buyers and users, is discussed in a new bulletin (No. 162) issued by the Wagner Electric Corp., St. Louis, Mo. The bulletin covers 8 pages and discusses also the purposes of transformer oil, its properties, methods of testing and precautions when handling and storing.

TherModine Unit Heaters, manufactured by the Modine Mfg. Co., Racine, Wis., are described in a recent bulletin issued by that company. The heater consists of a condenser assembly, a manifold and frame assembly, and a fan and motor assembly. The condenser consists of a larger number of flattened, vertical, seamless copper tubes rigidly held in position by a series of horizontal copper fins. It is a combination brazed and electrically welded structure. It is equipped with deflectors that direct the heated air stream in the vertical plane. Horizontal directional control is obtained by loosening the unions in the supply and return lines and pivoting the heater on the unions as an axis.

These heaters are manufactured in five series with ratings ranging from 90 to 700 sq. ft. of cast-iron radiation. The bulletin includes complete capacity tables and shows the application of these heaters to industrial plants.

How to Cut Heating Costs with the Trane System of Unit Heating is the title of the third edition of an especially attractive booklet issued by The Trane Co., LaCrosse, Wis. Illustrations in shades of brown show typical installations of Trane unit heaters for space heating. Comparisons of results of heating by direct radiation and unit heaters are made in clearly written text, followed by chapters on operating and installation costs. Cutaway, sectional, and phantom views show the construction of the Trane unit heater together with a description of each of the parts. Among the other subjects treated are Trane engineering service, cabinet heaters, concealed heaters and specialties. An appendix is devoted to blast heating and industrial drying. The book is well written and handsomely illustrated. Size 8⅝ in. x 10¾ in. Pp. 30.

Sprucolite, a bulletin issued by Sprucolite Corp., Bloomfield, N. J., tells about the company's line of pulleys made for a wide variety of uses. Sprucolite is manufactured from compressed spruce fibers. Features of the pulley are its pressed-in, cast-iron hub, high coefficient of friction, resiliency, lightness of weight, and ability to withstand moisture. A number of photographs show details of construction and applications. Size 8⅜ in. x 10½ in. Pp. 8.

Control Apparatus for Electrical Centrifugal Pumps is described in an illustrated bulletin issued by the Chicago Pump Co., 2300 Wolfram St., Chicago. Control panels, control boards, float switches, and automatic alternators are covered, including control for penumatic water systems, gravity tank house pumps, and bilge pumps and sewage ejectors. A safety feature is that every piece of starting equipment is individually boxed and is separate from every other piece on the panel or board. Size 8½ in. by 11 in. Pp. 12.

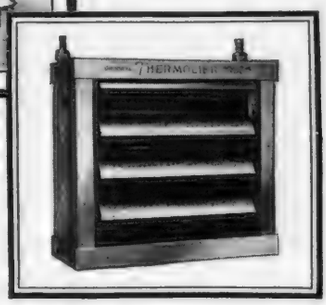
Brown Recording and Resistance Thermometers, including information on pyrometers, thermometers, flow meters, indicating and recording instruments, are featured in two catalogs published by the Brown Instrument Co., Philadelphia. Catalog No. 65 illustrates with external and broken-away photographs the company's line of indicating and recording thermometers for measuring temperatures between —40° and 800° F. A feature of the catalog is a number of full-page reproductions in color of typical charts showing the recording pen in action. A life-size reproduction of a 14 in. recording thermometer displays its construction features. Pp. 72.

Catalog No. 93 is devoted to a number of industrial uses to which electrical measuring instruments may be put. Range of temperature indication, recording, and controlling for these instruments is from —300° to 1000° F. Pp. 54. Size of both catalogs 8 in. by 10½ in.

Sales Promotion Material in connection with the marketing of Quaker Burnoil heaters is presented in a unique form of folder by the Quaker Mfg. Co., 215 North Michigan Ave., Chicago. Besides describing the company's plan of dealer-backing via direct mail, the folder contains an attractive 16-page catalog for presentation to prospects. Other samples include two folders for mailing, a work sheet, and a thank-you post card.

Thermolier
the copper unit heater

Made in eight models to fit any space and every condition.



One of the machine shops of a prominent New England manufacturer showing one of the 55 Thermolier copper unit heaters.

Constant, uniform *heat as evenly distributed as sunlight*

YOU ask "But where's the heating equipment?" when you visit this extensive, long-established New England manufacturing plant, a corner of which is reproduced above.

Then in the far corner you see a single THERMOLIER unit heater silhouetted between the full-windowed walls of the building. It is one of 55 THERMOLIERS installed throughout this large plant distributing warmth so evenly that the workers are never conscious of a heating system.

This uniform, *even* heat is controlled automatically by a Mercoid thermostat which keeps the temperature at any desired degree. It turns on, turns off, the fully enclosed, over-size, ball-bearing motor and aluminum fan, preventing overheating waste, underheating inefficiency.

"More capacity per dollar cost"

"We found by means of actual performance and condensation results," writes an engineering executive of the above mentioned plant, "that the THERMOLIERS actually radiate more than sufficient heat to justify their added cost. It was a question with us of capacity per dollar of cost."

Other plant engineers will want additional data on THERMOLIER low installation and maintenance costs. Which is why we want to send you the booklet

"Fourteen Points of Superiority"

Each point of THERMOLIER superiority is pictured in detail—the easily adjusted swivel socket hangers;

—The unique header construction that forces all condensation through a cooling leg integral with the unit;

—⅜ inch seamless copper tubes expanded into the cast-iron header, and

—The individually adjustable copper louvres.

GRINNELL COMPANY

Executive Office: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Title_____

Firm Name_____

Address_____

Quiet May Automatic Oil Burner is the title of a well-illustrated sales booklet published by May Oil Burner Corp., Baltimore, Md. Starting with a full-page reproduction, in color, of an ordinary water-heating system in basement and living room, the booklet carries the reader through the few changes necessary to convert to oil. A close-up of the tank and the simplicity of thermostatic control are shown pictorially. Fourteen full-page illustrations in color put across the sales story in a completely graphic manner. The accompanying text is concise but to the point and is conservatively presented. Entire make-up, tone, and appeal of the booklet are distinctly high-class and should inspire confidence in the company's product as well as in the entire oil-heating industry. Size 8 in. x 11 in. Pp. 32.

Kon-Nec-Tor, Bulletin 600, issued by Cooper Hewitt Electric Co., Hoboken, N. J., is an eight-page booklet describing an electrical switch with mercury-to-mercury contacts. In the heating and ventilating field, its applications extend to heat control, thermostatic switches, and similar devices. Size 8 in. x 1½ in.

Covers Industry Like a Blanket is the title of Bulletin No. 10-B1 describing rotary blowers, gas pumps, and meters manufactured by P. H. and F. M. Roots Co., Connersville, Ind. Types and sizes of each machine are discussed while several pages of typical commercial installations of Roots machinery are shown. Four pages list a long line of varied uses to which Roots blowers and pumps and meters, and accessories are put.

Low-Pressure Type Rotary Positive Blowers is the title of an accompanying Roots bulletin, No. 22-B1. This bulletin is confined to a discussion of blowers for various capacities at pressures of 2½ lbs. or less.

A third P. H. and F. M. Roots Company bulletin, (No. 1181) is a reprint of Engineering Tables published many years ago. A group of full-page tables and charts gives much engineering information in regard to hydraulics, thermodynamics, compressed air, ventilation, and other applied sciences which are needed by engineers working on blowers and associated machinery.

All three bulletins are bound in loose-leaf cover. Size 8½ in. x 11 in. Pp: 12, 16, and 32, respectively.

G. E. Arc-Welding School, an account of which is published in a bulletin issued by General Electric Co., Schenectady, N. Y., is another indication of the extent to which industry is training its workers before employing them. The bulletin and prospectus gives a complete picture of the school for training arc welders. To date, more than 900 men have received instruction in the courses. These cover hand arc welding, automatic arc welding, and atomic-hydrogen welding. After completion of the course, General Electric may assist the student to find employment. However, the school's goal is the production of competent and intelligent welders. Illustrated. Sizes 8 in. x 10½ in. Pp. 8.

This Way to Profits is the alluring title of a booklet describing a time-payment plan sponsored by the American Radiator and Standard Sanitary Corp., New York, and issued by the Heating and Plumbing Finance Corporation. After giving approximate percentages which show that many other necessities are sold largely on the time-payment plan, the booklet introduces the reader to the Heating and Plumbing Finance Corporation. This organization was formed by and is controlled by the American Radiator and Standard Sanitary Corporation. Details include typical forms showing the corporation's plan to assist dealers to sell more heating and plumbing equipment on time. Size 6 in. x 9 in. Pp. 20.

National Metaphram Damper Regulators are described in Bulletins LP-100 and F-100 published by National Regulator Co., 2301 Knox Ave., Chicago. Bulletin LP-100 is devoted to Metaphram damper regulators for low-pressure steam, vapor, and vacuum boilers. Five types of regulators are shown and details presented showing the construction of Metaphrams, the patented metal diaphragms used in control equipment. Bulletin F-100 deals with type F regulators for the control of water boilers and domestic water heaters. Size 8½ in. x 11 in. Each has 8 pages. AIA File No. 30C3.

Universal Heating and Ventilating Unit is the title of Publication No. 212 received from John J. Nesbitt, Inc., Holmesburg, Philadelphia, Pa. The book discusses the importance of proper air motion without draft, and explains the advantages of this unit for school installation. Sectional views show the construction of the unit, and it explains how it may be installed in either new or old buildings. Eleven points of superiority are listed, and a description of the motor and fan, condenser, transformer, and induction motor is given in detail. Bristol recording charts are presented showing the evenness of temperature maintained in a school equipped with Universal units. Complete tables of capacities at various temperatures are given, together with typical specifications and dimension tables. Size 8½ in. by 11 in. Pp. 32.

Hand Book on Heating Buildings with Bryant gas boilers has been received from the Bryant Heater & Mfg. Co., 17825 St. Clair Ave., Cleveland, O. The book contains not only data and ratings for the selection of the right size boiler, dimension tables and drawings, but includes beautiful colored plates showing attractive basement recreation and playroom, living-room and basement kitchen, in which Bryant boilers are installed. Construction details of the Bryant boiler and a large amount of engineering data are included. This hand book is outstanding among the literature on the subject of gas house-heating. Size 8½ in. x 11 in. Pp. 20.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF HEATING AND VENTILATING, published monthly at New York, N. Y., for October 1, 1929.

State of New York, County of New York, ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Arthur S. Armagnac, who, having been duly sworn according to law, deposes and says that he is the editor of Heating and Ventilating and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, National Trade Journals, Inc., 521 Fifth Ave., New York, N. Y.

Editor, Arthur S. Armagnac, 521 Fifth Ave., New York, N. Y.

Managing Editor, none.

Business Manager, Cliff W. Presdee, 521 Fifth Ave., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

National Trade Journals, Inc., 521 Fifth Ave., New York, N. Y.; Maynard S. Bird, 63 Wall St., New York; Goldman-Sachs & Co., 30 Pine St., New York; H. Hentz & Co., 60 Beaver St., New York; Hornblower & Weeks, 42 Broadway, New York; F. B. Keech & Co., 52 Broadway, New York; Herman E. Nelson, 2406 Belle Glade Ave., St. Louis, Mo.; Miss Rosalie Onorato, 836 Union St., New Orleans, La.; H. J. Redfield, 521 Fifth Ave., New York; Edward T. Roche, 527 Fifth Ave., New York; C. Stanley Taylor, 40 East 49th St., New York; John T. Wilson, 521 Fifth Ave., New York; Rupert T. Zickl, 63 Wall St., New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

ARTHUR S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 20th day of September, 1929.

MADELINE DIETRICH.

Notary Public, Bronx County.
(Commission expires, March 30, 1931.)
Bronx County Clerk's No. 35.
New York County Clerk's No. 135.
Register's No. 1D164.

¾ Horse Power Century Type SC
Squirrel Cage Induction 3 and 2 Phase Motor

Long Life Bearings

Protected Against Abrasive Wear

The long bearing life of Century Fractional horse power 3 and 2 Phase Motors is due to their being equipped with tight-fitting dust cap and dust collars, which make the bearing housings as nearly dust-tight as it is possible to build them. They remain so throughout the life of the motor . . . Flying particles of dust and dirt cannot reach the bearing surfaces through the oil wells, because of the filtering action of the continuous strands of pure wool yarn used in the Century Wool-yarn System of Lubrication . . . There is no drain plug at the bottom of the oil well.

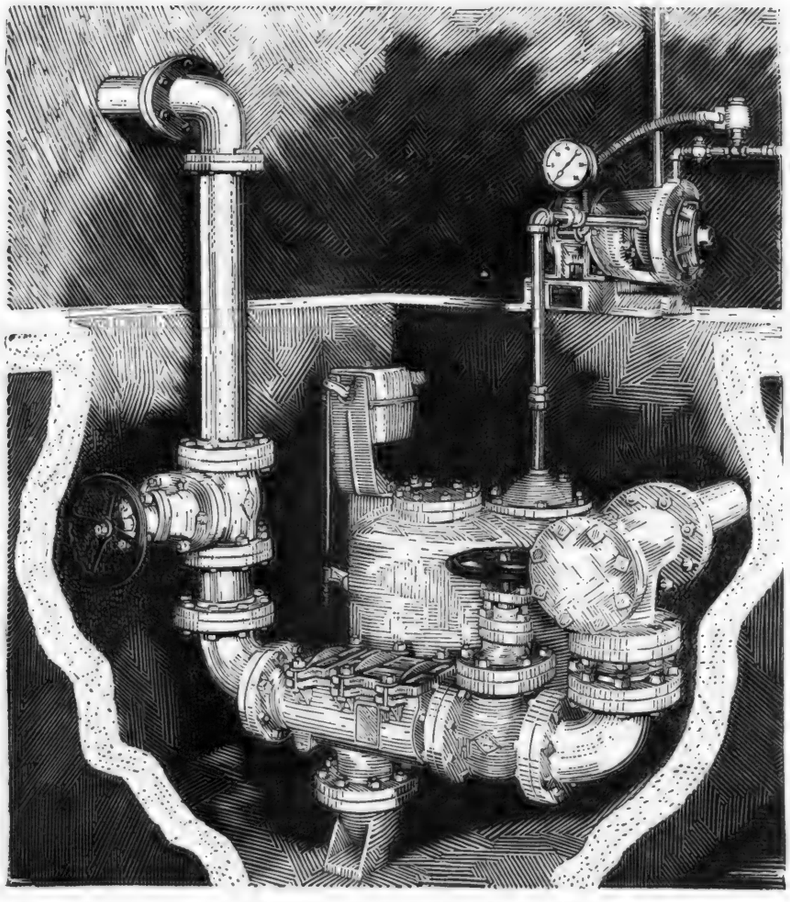
Built in standard sizes from 1/4 to 250 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

40 U. S. and Canadian Stock Points and more than 75 outside thereof

Century MOTORS

"THEY KEEP A-RUNNING"



This small Jennings Sewage Ejector has a capacity of 30 g.p.m. Other sizes range in capacity from 50 to 1500 g.p.m. with heads up to 50 ft.

Cannot clog—

handles anything that will pass through a 4" pipe

For handling small quantities of sewage, the 30 gallon Jennings Ejector is an inexpensive unit which operates at low cost.

Similar in construction to the larger Jennings units, this small ejector works pneumatically without employing air valves, reciprocating compressors or other complicated devices. Screens are unnecessary and, since no vital working parts come in contact with the sewage, efficiency can never be impaired by parts becoming caked with solid matter. Extra large inlets and outlets, four inches in diameter, are provided, permitting the ejector to handle large solids without clogging.

This 30 gallon Jennings unit is just the ejector for installation in basements of apartment houses, hotels and public buildings where it is necessary to raise sewage and drainage from toilets and other fixtures to street sewer level automatically and with little or no attention. The receiving pot may be placed in a pit in any out-of-the-way corner, the Nash Hytor compresser and driving motor on the basement floor level, or on wall brackets, where they are always accessible.

Jennings Pumps

THE NASH ENGINEERING CO WILSON ROAD, SOUTH NORWALK, CONN.

Trade and Miscellaneous Notes

Coming Events

November 13-15, 1929. Annual convention of the International Acetylene Association in Chicago. Headquarters at the Congress Hotel.

December 2-6, 1929. Annual meeting of the American Society of Mechanical Engineers in New York. Headquarters at the Societies' Bldg., 29 West 39th St.

December 2-7, 1929. Eighth National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

December 3-4, 1929. Mid-year meeting of the National Warm-Air Heating Association, at Columbus, O. Headquarters at the Deshler-Wallick Hotel.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at the Benjamin Franklin Hotel.

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

April 7-12, 1930. Seventh annual convention of the American Oil Burner Association in Chicago, Ill. Headquarters at the Hotel Stevens.

J. F. Quereau Leaves University of Illinois

On September 15, J. F. Quereau resigned as special research assistant at the University of Illinois to become associated with the Leeds and Northrup Company, of Philadelphia, Pa., in the engineering development division, which develops new instruments for commercial use.

Mr. Quereau was with the university for three years; research graduate assistant (half-time research and half-time graduate study) 1926-28, and special research assistant (full-time research) 1928-29. The research problem on which he was working during the three years was the cooperative investigation of warm-air heating systems being carried on at the university by the National Warm-Air Heating Association.

Creviston Associated with Crane Company

Russell G. Creviston, formerly general manager of the Plumbing and Heating Industries Bureau, is now associated with the Crane Co., Chicago, Ill., in the sales and promotional division.

Mr. Creviston, who has been in active charge of the work of the bureau for several years, gave up his position on October 1. In recent months, a decision to curtail the expenditures of the bureau and to reduce its activities led to Mr. Creviston's decision to give up his work with the organization.

Oil Heating Institute to Continue Under Secretary of A. O. B. A.

At the meeting of the executive committee of the American Oil Burner Association in Baltimore October 22-23, it was decided to continue the activities of the Oil Heating Institute under the direction of the executive secretary of the association.

The committee met to study the plan proposed by the patent committee. The plan as presented by the patent committee was approved, and the committee authorized them to proceed with the work.

Plans were discussed with reference to the sale of space and the program for the Seventh Annual Convention to be held in Chicago, April 7-12, 1930. Action of the executive committee with reference to the selection of Harry F. Tapp, as executive secretary and treasurer, was approved. Those present were: E. P. Bailey, Lionel L Jacobs, C. H. Chalmers, J. C. Coonley, Jr., Morgan J. Hammers, W. T. Koken, J. H. McIlvaine, G. P. Kittle, Edward Blake, J. F. Griswold, L. A. Welsh, I. M. Nelson, E. M. Fleischmann, W. F. Tant, H. Finnie, J. N. Nirach, Earl Marr, M. E. Simpson, Leod D. Becker, Edward B. Alexander, Harry F. Tapp.

Furnace Manufacturers Form Institute

Following a preliminary meeting called by the Better Business Committee of the National Warm Air Heating Association, and to which all manufacturers of warm-air furnaces were invited, and at a second conference held recently, a Warm Air Furnace Institute was organized with the following officers:

President, W. G. Wise; vice-president, C. E. Olsen; secretary-treasurer, Allen W. Williams, and counsel, B. G. Watson. Executive committee: H. T. Richardson, E. B. Langenberg, H. P. Mueller, H. M. Sawrie, and I. L. Jones.

While this organization is distinct from the National Warm Air Heating Association it has the endorsement and cooperation of the latter society. Its purpose is to eliminate the economical abuses which have crept into the business of manufacturing and selling warm-air furnaces. The institute includes only the manufacturers of warm-air furnaces, and one of its first objects has been to arrange for a Trade Practice Conference of makers of warm-air furnaces under the direction of the Federal Trade Commission.

The two meetings which the institute has held have been largely attended, and the organization is receiving the enthusiastic support of large and small furnace manufacturers. Formation of the institute was necessary to provide means for carrying out agreements which may be made at the Trade Practice Conference, and since it was not advisable to place this work upon the National Warm Air Heating Association with its own large field of activities. The work of the N.W.A.H.A. will be continued as usual.

Jobbers' Credit Association Holds Dinner and Dance

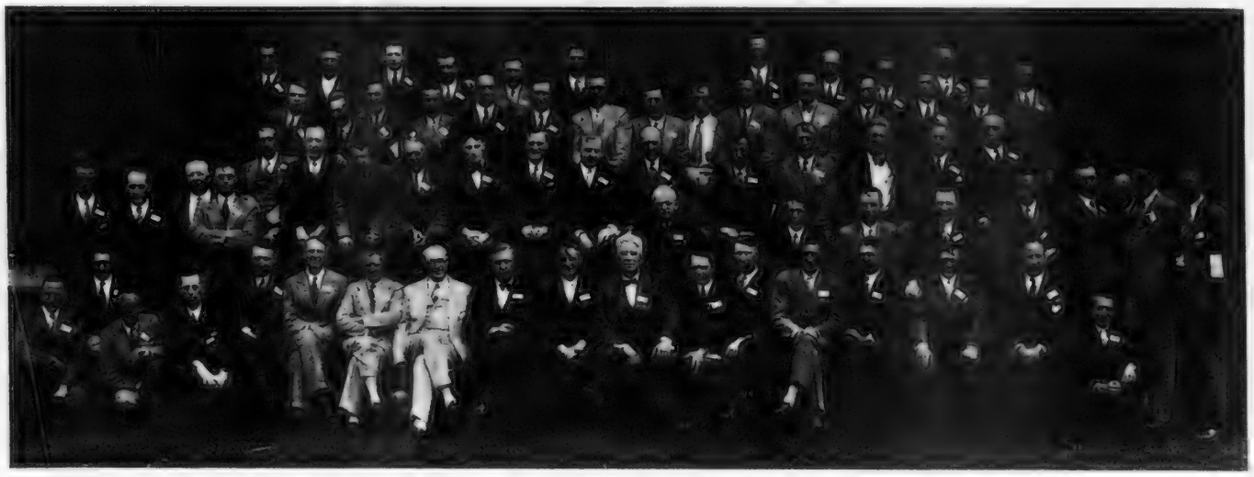
The fifth annual dinner and dance of the Jobbers' Credit Association, Inc., held at the Hotel Commodore, Saturday evening, November 9, was arranged by the following committee:

Mortimer Smolka, chairman, E. Smolka Plumbing Supply Company.
Charles Schwartz, E. Schwartz Plumbing Supply Company.
E. E. Basch, Regent Plumbers Supply Company, Inc.
J. A. Hurley, Pierce Butler & Pierce Mfg. Corporation.
J. H. Ritchie, Crane Company.
T. W. Bieder, Westchester Square Plumbing Supply Company.
Morris Speckler, Morris Plumbing Supply Company.
S. C. Breihof, Dimock & Fink Company.
C. W. Mitchell, W. H. Hussey & Son.
Richard Berger, Ben Kramer.
B. S. Zorwitz, New York Plumbers' Specialties Company, Inc.

Officers of the association are:

President, Milton M. Goldsmith; first vice-president, J. A. Hurley; second vice-president, S. C. Breihof; third vice-president, E. E. Basch; treasurer, Edward Schwartz, and secretary, Glenn B. Van Buren.

The secretary is located at headquarters at 342 Madison Ave., New York.



Annual Sales and Engineering Convention of the Carrier Engineering Corporation

Carrier Engineering Corporation Convention

From September 18 to 20, the Carrier Engineering Corporation held its annual engineering and sales convention at its general offices in Newark, N. J. The sessions, under the direction of E. T. Murphy, vice-president in charge of sales, were devoted to a series of papers and discussions on new developments and applications of air conditioning in the industrial and public building fields. Engineers of the company from all offices were in attendance.

Miscellaneous Items

September building operations, as reported by the F. W. Dodge Corporation, show a decline of 9% from the total for August and 24% from the total for September of last year. The total figures for the 37 states east of the Rocky Mountains were $445,402,300. Analysis of this record shows that 27% of all construction was for residential buildings, 26% for pub'ic works and utilities, 17% for commercial buildings, 12% for industrial plants and 7% for educational projects.

Contracts in New York State and Northern New Jersey amounted to $81,222,500, representing a 14% decrease when compared with the total for August, and a 48% decrease below the total for September, 1928. In the New England States the figures amounted to $34,297,700, showing a slight increase of 3% over the record for August, but a decrease of 52% from the total for September, 1928.

In the Middle Atlantic States contracts amounted to $48,822,200, an increase of 7% over the preceding month, but a decrease of 25% when compared with September of last year. Contracts in the Pittsburgh District amounted to $70,200,700, representing an increase of 5% over the total for August, 1929, and a decrease of 26% from the total for September of last year.

Figures in the Central West amounted to $155,151,900, an increase of 1% over the total for August, 1929, and also an increase of 6% when compared with September of last year. In the Northwest contracts amounted to $7,640,600, showing an increase of 12% over contracts for the same month a year ago, but a decrease of 8% from August of this year.

Contracts in the Southeastern States amounted to $33,015,400, which represents a 52% decrease below the August total and 36% below the total for September of last year. Texas reports contracts amounting to $15,051,300, showing a 16% decrease when compared with the total for August and 1% less than the total for September of last year.

The National Industrial Exposition, held under the management of the Midwestern Engineering Exposition, Inc., Chicago, will be held in that city March 3-7, 1930. Labor saving, material handling, new construction materials and designs, power transmission and connections, safety devices, and many other factory and industrial appliances and supplies will be on display.

Construction reports for new buildings are to the effect that the United States is spending $425,000,000 this year. School erection today stands third in all building activities. Office buildings supplied 13.5% of the total last year; apartments, 13.1%, and educational structures, 11.7%.

C. W. Farrar, of the Excelso Products Corp., Buffalo, N. Y., returned from a trip in the Middle West, where he addressed the local chapters of the A.S.H.V.E. in Chicago, St. Louis, Kansas City, and Minneapolis.

M. G. Harbula, consulting engineer, has moved his offices to Suite 846, General Motors Bldg., 1775 Broadway, New York.

Manufacturers' Notes

O-E Specialty Mfg. Corp., Milwaukee, Wis., has taken over, in entirety, the original O-E Specialty Mfg. Company. The new corporation has taken larger quarters at 1710-1712 St. Paul Avenue. Officers of the company are: President and treasurer, Lewis F. Ostrander; vice-president, John P. Owens; secretary, Alfred Prinz; auditor and assistant treasurer, Carl C. Ganiere, and territorial sales manager, John A. Holman.

Rome Brass Radiator Corp., 1 East 42nd St., New York, announces that James D. Erskine, formerly vice-president and eastern manager of sales of the American Radiator Company, is on an extended visit to the Midwest, calling on the various offices and sales representatives of the Rome Brass Radiator Corporation, of which he is president.

Murray Iron Works Co., Burlington, Ia., announces the following appointments of selling agencies: Isaac Hardeman, 1107 Queens Road, Charlotte, N. C.; C. Keiser & Co., 610 West Fairview Ave., Dayton, O.; William Rudolph, 207 Mesnager St., Los Angeles, Calif., and P. Schmertz, 7338 Woodward Ave., Detroit, Mich.

Crane Co., Chicago, has acquired property in Stamford, Conn., where it will house its local branch office. The location is 126 ft. wide by 100 ft. long. The building on the property will be converted into a showroom, office and warehouse.

Kellogg-Mackay Co., Chicago, Ill., announces that the Northwest Service Station, the new Chicago branch of the company, was opened for the growing trade in that section. Several branches will be established equipped with a full line of heating and plumbing materials.

Swartwout Co., Cleveland, O., has taken over the entire business of the S-C Regulator Manufacturing Company of Fostoria, O., and is now manufacturing all S-C products in its own plant.

NOW, "Mr. KEYMAN"...1 minute

The SPEED HEATER . . . a new Sturtevant product at a democratic price!

Mr. Keyman: You may know that methods of heating our industrial plants and large floor areas are rapidly changing. Valuable steam need no longer be cooped up in bulky radiators and coils.

SPEED HEATERS put *all* steam to work...make for more comfortable heating...at lower initial cost...at a much lower operating cost.

When we asked 2000 architects if they were interested in such savings, 1100 answered "yes" and asked for full details.

May we send *you* these details? The handy coupon will bring them to you. Sign it up and send it out today!

THE PRICE IS 'WAY DOWN

COUPON

B. F. STURTEVANT CO.
Hyde Park, Boston, Mass.

Kindly send me a copy of the Speed Heater Data Book.

Name of Company.....

Street Address.....

City.....*State*.....

B. F. STURTEVANT COMPANY

Plants and Offices at: Berkeley, Cal. ◥ Camden, N.J. ◥ Framingham, Mass. Galt, Ontario ◥ Hyde Park, Mass. ◥ Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D.C. ◥ *Canadian Offices at:* Toronto; Montreal and Galt. ◥ *Canadian Representatives:* Kipp Kelly, Ltd., Winnipeg

Also Agents in Principal Foreign Countries

Sturtevant (REG. U. S. PAT. OFF.)

SPEED HEATERS "More Heat Less Steam"

Lincoln Electric Co., Cleveland, O., has placed contracts for the erection of a large addition to its present plant, to provide increased manufacturing facilities. This will add approximately half an acre of floor space, and the new structure will be approximately 200 ft. wide by 110 ft. long and will house a 65-ft. span electric traveling crane. The steel superstructure will be entirely of arc welded construction.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., announces the appointment of William F. Arnoldy as manager of the New England office of the company at Boston, Mass. Mr. Arnoldy has been with the company for eight years, recently serving as manager of the Milwaukee office.

Sweet & Doyle Foundry and Machine Co., Troy, N. Y., has opened a new sales office in Boston, Mass., with Charles B. Durst in charge. A complete display of Sweet & Doyle burners and a typical installation are on exhibit at this branch.

Chicago Mill and Lumber Corp., Chicago, Ill., announces that J. J. Kehoe has joined its insulating board division to supervise all sales in the special industrial field. Mr. Kehoe formerly was connected with the refrigeration division of the General Electric Company.

The Cooling and Air Conditioning Corp., 11 West 42nd St., New York, announces that W. H. Doron, formerly sales engineer of the ice machine department of De La Vergne Machine Company, has joined the organization as sales engineer specializing in application of air conditioning equipment to industrial processes.

Combustion Engineering Corp., New York, has opened a district office at Room 606, 1411 Fourth Ave., Seattle, Wash., with George M. Bechtel as branch manager. Mr. Bechtel was transferred from the Los Angeles office.

Winslow Boiler & Engineering Co., Chicago, Ill., reports that W. H. Rehm, president, has returned from a trip through the East. In New York, Mr. Rehm gave a luncheon at the Commodore Hotel to the Metropolitan dealers. William E. McKenzie, formerly service manager of the Chicago branch for Kleen-Heet, has been made general service manager of the national organization. Mr. McKenzie is instituting a system of dealer cooperation whereby dealers will be able to secure the aid of the Winslow company in the employment of service crews, solution of installation problems, and instructions on cost systems. E. J. Grant has been appointed advertising manager of the company to supervise all Kleen-Heet advertising and sales promotion. Charles Schleicher, for the past eight years with Schleicher, Inc., New York, has joined the New York Kleen-Heet organization. The following have been appointed Kleen-Heet dealers:

William H. Clark, Bridgeport, Conn.; Hahn Roofing & Heating Co., Inc., Birmingham, Ala.; S. H. Hamaker, Rochelle, Ill.; M. B. Quall, Clintonville, Wis.; Roy Hurt, Desmet, S. D.; M. J. Gallagher, Erie, Pa.; E. C. Ellerbusch, Evansville, Ind.; Smith Bros., Houlton, Me.; Pekin Plumbing Co., Pekin, Ill.; Murray-Landers Co., Peekskill, N. Y.; American Gas & Oil Co., Wakefield, Mass.; Walker Indian Co., Boston, Mass.; Leader Filling Stations Corp., Lynn, Mass.

Sprayo-Flake Co., Milwaukee, Wis., reports that in keeping with its policy to nationalize distribution of Sprayo-Flake insulation, the Sprayo-Flake Corporation of New York, 101 Park Ave., New York, will assume the insulation franchise of the American Materials Company of New York City.

Kewanee Boiler Corp., Kewanee, Ill., announces additional warehouse space and facilities for handling a larger stock of steel water heaters and tanks at its Milwaukee branch at 440-450 Barclay Street, with Fred G. Weimer continuing in charge.

Pattison Brothers, 70 East 45th St., New York, consulting engineers, are now located at these new quarters.

Ric-wiL Co., Cleveland, O., has appointed Ralph E. Dodson, formerly manager of the Cincinnati office of Keasby Mattison Company, as special representative with headquarters at the Chicago office of the Ric-wiL Co., at 724 Harris Trust Building.

S. T. Johnson Co., Oakland, Calif., celebrated its 25th Anniversary by an exhibition for home-owners, architects and builders throughout the San Francisco bay district, held in the retail display rooms of the company. One of the features of this first oil-burner show held in Oakland was the silver cutaway model of the new electrically ignited Johnson automatic oil burner, as well as the successive Johnson burners from the early days of the manufacture.

The following representatives for Johnson equipment were appointed: E. Tucker, Sutter Creek, Calif.; Bristol Electric Co., Bristol, Conn.; Oil Burner & Supply Co., Cleveland, O.; E. P. Knauer Co., Manitowoc, Wis.; Warning Sheet Metal Co., Oshkosh, Wis.; Ralph King, Atlantic, Iowa; Peterson Roofing & Supply Co., Mason City, Iowa; L. C. McDill, Dunsmuir, Calif.; J. Frank Boyer Plumbing Co., Norristown, Pa.; L. G. Geberd, Ventnor, N. J.; A. G. Rushlight & Co., Portland, Ore.; S. & H. Engineering Co., Montreal, Can.; Oil Burner Service Co., Rockford, Ill.; Raymond H. Bell, Jr., Columbus, O., and Andersen, Mayer & Co., Ltd., Shanghai, China.

International Burners Corp., 225 West 34th St., New York, announces that John H. Hassinger has been promoted to the position of sales manager, after serving as assistant sales manager for the past two years. G. H. Percival has been appointed district sales manager for the Baltimore, Philadelphia and Southern New Jersey territory. R. H. Brandt will be field representative for part of the New England territory. The following dealers have been appointed:

Baehrle & Roedel, Lynnbrook, L. I.; A. J. De Blois Oil Co., N. Attleboro, Mass.; George F. Eberle & Son, Corona, L. I.; Forest Hills Plumbing & Heating Co., Forest Hills, L. I.; Hudson Falls Hardware Co., Hudson Falls, N. Y.; R. H. Johnson Co., Ocean City, N. J.; Charles T. King & Co., Baltimore, Md.; Mureld L. Lain, Crown Point, Ind.; Lowes Electric Shop, Hillsdale, Mich.; Alfred P. MacDonald, New Hyde Park, L. I.; Stanley L. Murray, Bloomington, Ind.; Monmouth Utilities Co., Inc., Long Branch, N. J.; Theodore Ruff, Whitestone, L. I.; San-O-Heat, Ltd., Vancouver, B. C., Can.; John H. Simpson, Durham, N. H.; The Shaffer Construction Co., Hartford, Conn.

Watts Regulator Co., Lawrence, Mass., announces that new jobbers' discount sheets, new trade discount sheets and a new catalog of the Watts line are ready for distribution. John G. Kelly, Inc., 210 E. 45th St., New York, are sales associates for this company in United States and Canada. Discount lists and catalogs can be obtained from the following representatives outside of New York: William H. Wix, Baltimore; George A. Suits, Medford, Mass.; Fred S. Wilsey, Minneapolis; Johnnie Moore, Chicago; Ernest Sanger, Detroit; George E. Kitson Co., Philadelphia; M. M. Rivard Sales Co., Kansas City, Mo.; J. B. James, Pittsburgh; Walmsley Sales Co., Cleveland, and Cunningham & Hill, Ltd., Toronto.

Hall Electric Heating Co., Philadelphia, Pa., announces the appointment of A. O. Miller, formerly of the American-Brown Boverie Electric Corporation, as sales manager. Mr. Miller has been associated with the Hall company since July.

Changes of Address

Comet Radiator Co., Philadelphia, Pa., has moved from 2010 Market Street to 626 Integrity Bldg., 16th and Walnut Streets.

Wagner Electric Corp., St. Louis, announces the removal of the Milwaukee sales office and service station from 501 Broadway to 525-7 Broadway, and the St. Louis sales office from 505 Shell Building to 909 Plaza Olive Building.

Air-Way
UNIT HEATERS

Consider These Facts About Air-Way Unit Heaters

Air-Way Unit Heaters differ from others operating under the same principle in many important features which bear directly and vitally upon operating cost and results obtained.

There is nothing new in taking warm air from the upper strata of a room and projecting it downward or in any other direction.

But there is nothing else like the design and construction of the Air-Way heating element.

Because of its original and exclusive design and construction it furnishes a greater volume of heated or treated air per second, and projects this air with the exactly proper velocity to disseminate it to every part of the area involved.

Because of the greater efficiency in operation of the Air-Way heating element the desired result is accomplished with less fuel.

Because of its integrally cast unit construction the Air-Way heater is trouble-proof—steam and water hammering cannot impair it, galvanic action cannot weaken it, freezing will not crack it,—it just cannot leak.

All these valuable advantages are the result of exclusive and *fundamental* features of plan of operation, design of the unit, and construction.

These are pertinent facts for the consideration of the executive who is approaching the modernization of his factory, shop or office by the installation of a heating and air conditioning system that will actually raise the volume of labor production per hour without increasing production cost.

A large, experienced, competent air-engineering department is here ready to apply itself to your particular problem. Your inquiry for further information does not commit or obligate you.

Air-Way
HEATING SYSTEMS DIVISION

AIR-WAY ELECTRIC APPLIANCE CORPORATION, Toledo, Ohio

Classified Advertising

Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

PRECISION

is a synonym for our service when we are mentioned by the Heating and Ventilating industry. The exactness of our operating methods in research has been given the stamp of national recognition by those whom we have served in the past.

All branches of Heating, Ventilating, Air Conditioning, District Heating and allied problems find ready reference in our completely equipped Laboratories.

Correspondence from manufacturers, architects and engineers is cordially invited, and assurance is given of our fullest co-operation.

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RESEARCH LABORATORY
Incorporated
1326 MARKLEY STREET
NORRISTOWN PENNSYLVANIA

SALES ENGINEER WANTED: Preferably young college graduate who has had some experience in Heating and Ventilation. New Jersey territory. In reply state age, education and salary expected. Address Box 79, care of Heating and Ventilating.

WANTED: Responsible position on Design, Specification and Superintendence of Mechanical Equipment of buildings. Ten years' practical experience at present position with leading architects and engineers. Married, satisfactory references, 33 years of age. State full details in reply. Address Box 77, care of Heating and Ventilating.

WANTED: Mechanical Engineer for heating utility position. Applicant to be a recent college graduate. Address Box 78, care of Heating and Ventilating.

BUILDING SERVICE ENGINEERS & DESIGNERS WANTED

Stone & Webster Engineering Corporation has several desirable openings for building service engineers and designers. Men with a thorough knowledge of heating, ventilation, plumbing and fire protection requirements for power stations, industrial plants and office buildings, are desired. Engineers should have experience and training which qualifies them to supervise, design, prepare specifications and purchase materials. Designers should be qualified to handle design and computations and to prepare working plans. Apply in writing to Stone & Webster Engineering Corp'n, 49 Federal St., Boston, Mass., enclosing recent photograph and record of personal history and experience.

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"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Winter to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

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HEATING and VENTILATING Sales Engineers with successful sales experience in fan industry wanted. Address application to Box 81, Heating and Ventilating.

SALES MANAGER: Present sales manager unit heater manufacture will consider offer from progressive, financially able company. Address Box 80, care of Heating and Ventilating.

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We would like to enter your order for this New Edition. It has three new chapters and gives the very latest engineering data and manufacturers' catalogs so completely indexed you can locate any item at a glance. There are over 1000 pages 6 x 9 inches, cloth bound. Price $5.00 delivered.

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Heating and Ventilating Book Dept.,
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You may send one A. S. H. & V. E. Guide. Enclosed find $5.00.

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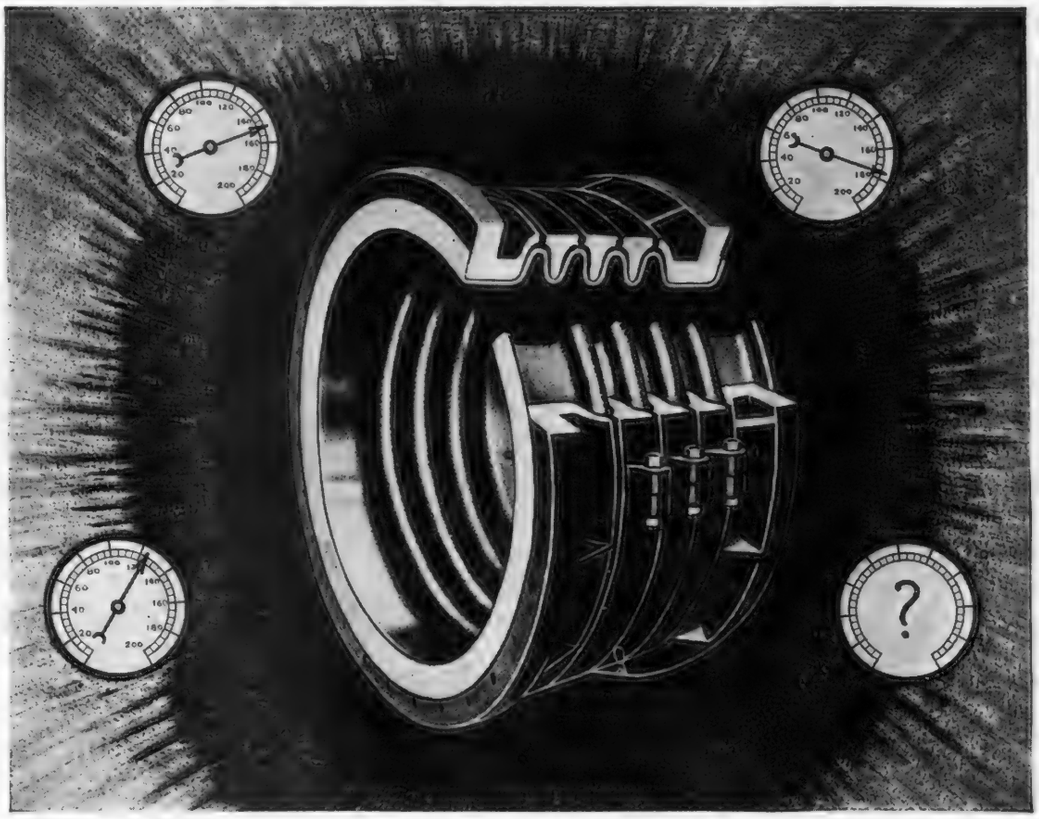

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ONE company using several thousand Badger Self-Equalizing Expansion Joints reports that many of them operate under 175 pounds pressure.

It also reports that they are very satisfactory joints. They stay tight. They are safe.

This same type of joint would be suitable for even higher pressures. In fact, the only limit is that which demands a tubing of copper too thick to function properly at the corrugations.

You can rest assured that Badger Self-Equalizing Joints, when recommended by our engineers, will be safe for any pressure to which they are to be subjected.

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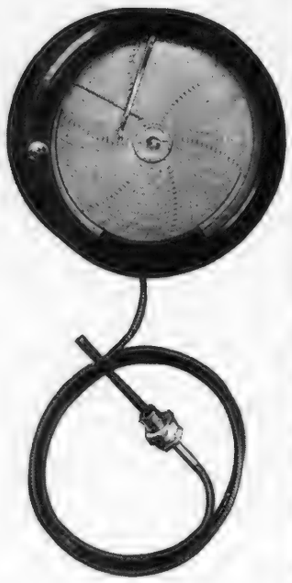
Recorders of Profits

THE thin, red line traces a record of profits . . . . the chart is the engineer's balance sheet.

Have you ever made a study to determine exactly your one best temperature? And have you taken the time to figure out the profits and losses resulting from any variation from this temperature? Just try it. Sometimes a difference of only a few degrees means hundreds of dollars. American Recording Thermometers give you a record of facts . . . they are Recorders of Profits.



This is Type 3300 American Recording Thermometer. It is actuated by mercury. Made for any temperature range from minus 40 to plus 1000° F. The chart is 10 in. in diameter. The case is die cast with a beautiful black enamel finish. It is moisture proof. The pen-arm is Monel metal, and glass fountain pens are used. The flexible connecting tubing is steel covered by spiral bronze armor over which phosphor bronze braiding is woven. It is the only Recorder furnished with the Time Punch, making every instrument a Watchman's Clock. Accuracy is guaranteed. Compare its construction and accuracy by test!

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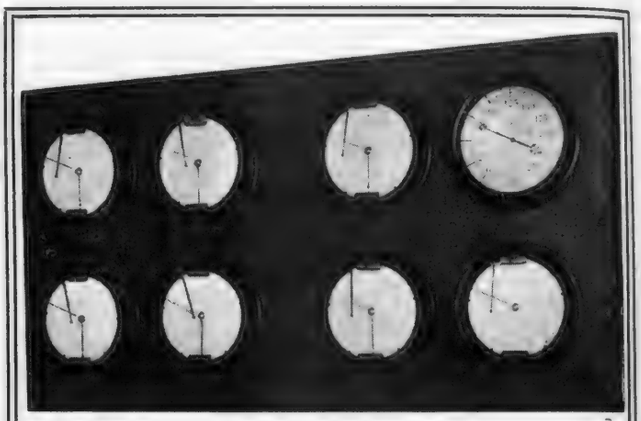

Foxboro Instrument Board at Federal Reserve Bank, Boston.

"Shooting the Sun" in the Boiler Room

THE navigator must "shoot the sun" every day to determine his exact position. In the modern boiler room, the engineer determines his position by a glance at his Foxboro Instrument Board. Facts are centralized at a convenient point.

Each Instrument has its story to tell. The Foxboro Recording Thermometer on the boiler feed water, charts a complete and accurate record of the operation of the preheater and economizer. Comparison of charts points to any irregularity in operation. It is in this way your savings are made.

Foxboro Instruments are saving time and money in hundreds of buildings. A guarantee of permanent calibration is sealed to each Instrument. It is the tangible expression of the high quality of Foxboro Instruments. It is your protection. Let a Foxboro Engineer tell you more about them. Write the nearest Branch.

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THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure.

Remember! Armstrong traps for those unit heaters

DON'T overlook that problem of draining unit heaters. Condensate and air unless completely removed will decrease the capacity and efficiency of the heater units, and will cause a lot of trouble and grief. You can avoid all of this by installing Armstrong Traps under the unit heaters, and assure yourself of a successful job.

Armstrong Traps keep unit heaters at their maximum efficiency. They drain all the condensate regardless of temperatures. No air valve is needed with the Armstrong.

Accumulated air and gases are discharged with the condensate. They are water sealed at all times against the leakage of live steam. Armstrong Traps have a large capacity for their small size. Heat-treated chrome steel valves and sturdy construction of all parts give trouble-free operation for a period of years.

There are thousands of Armstrong Traps in use in hundreds of industries. If you don't know how good they are, ask the first user you meet—then on your next job remember—Armstrong Traps for those unit heaters.

ARMSTRONG MACHINE WORKS
346 Maple St., THREE RIVERS, MICH.
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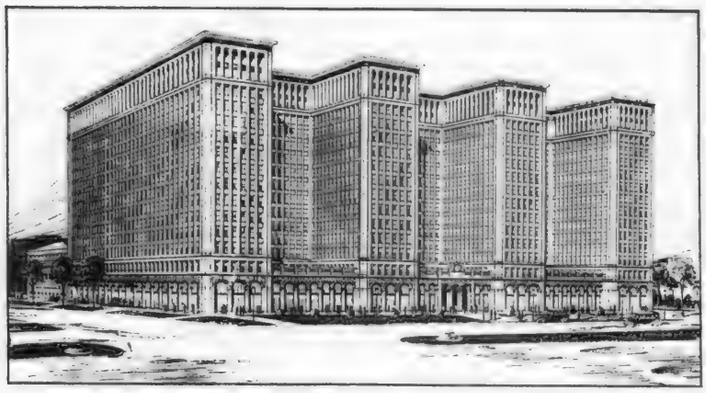
ARMSTRONG "INVERTED BUCKET" STEAM TRAP

H & V 11-Gray

WHITLOCK SERVICE WATER HEATERS

in the GENERAL MOTORS BUILDING



How frequently Whitlock Heaters are mentioned in connection with the leading industries of the country!

In the largest office buildings—such as that pictured above—all over the country, Whitlock Service Water Heaters are furnishing water for the needs and comforts of the busy workers.

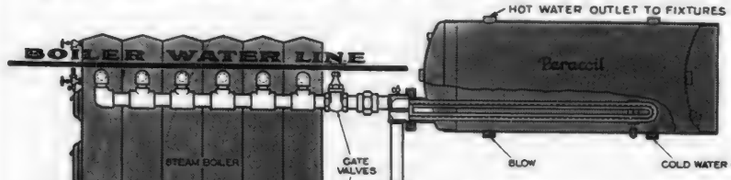
Other types of Whitlock Equipment—such as coolers, condensers, and heat exchangers—are recognized and used by these same great concerns in their factories.

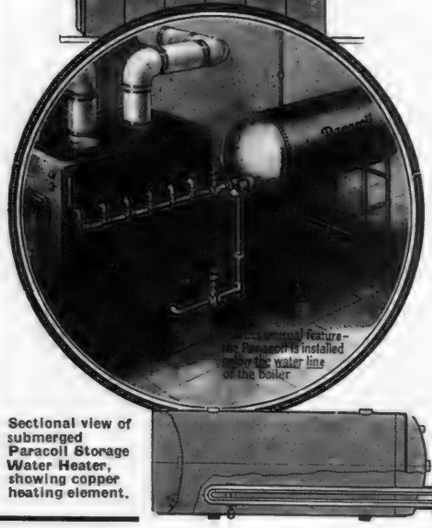
A 'phone call to our nearest office—consult your local telephone directory, or that of the nearest large city, under our name—will bring one of our Hot Water Engineers—who will gladly work with you. Or drop a line to us at Hartford for catalog and data sheets.

NEW YORK PHILADELPHIA BALTIMORE LOS ANGELES BOSTON CHICAGO DETROIT SAN FRANCISCO
and other principal cities. Consult telephone book.

The Whitlock Coil Pipe Company, 40 South St., Hartford, Conn.

The submerged type storage Water Heater





Sectional view of submerged Paracoil Storage Water Heater, showing copper heating element.

For the 1 to 10 Family Job—

Paracoil "below water line" indirect heaters have been approved by more than a quarter of a million users.

We are now prepared to supply for the small job the Paracoil storage heater, a combination tank and heater, using this same "below water line" principle and having the following

ADVANTAGES

- Clogging of circulating lines lessened
- Tank and Heater in One Unit
- Installation Costs Less
- Less Piping Required
- Fuel Saved
- No Water Hammer
- No Separate Summer Heater Needed
- Hot Water Always Instantly Available (even when fires are banked)

The submerged Paracoil type water heater is the result of an insistent demand on the part of heating engineers and plumbers, for a storage tank and heater combined in one unit—the unit to be applied economically to the small 1 to 10 family job the same as the below water line installation has been applied in large storage heater units for office buildings and large apartment houses.

Write for Bulletin. Also write for Bulletin describing Paracoil Water Heaters for larger number of families.

DAVIS ENGINEERING CORPORATION 90 WEST STREET NEW YORK, N. Y.

Paracoil
Storage Water Heater

PIONEERING VENTILATION *with* Helmet *and* Goggles

As an aeronautical engineer and designer of the famous Hartzell Cross-Country Propeller, Fred Charavay pioneered this new plan of ventilation. He knew his especially designed propeller had super "air moving" power, so he adapted it to ventilation—producing the first and only of its kind, the Charavay Propeller Fan.

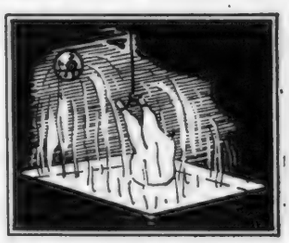
Only CHARAVAY

Propeller-Type Fans Can Give You Charavay's Greatest Air Volume

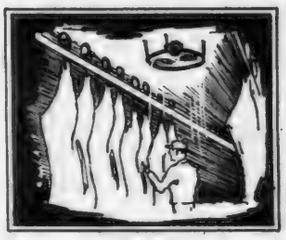
On the Charavay Fan the tip of the propeller blade extends beyond the inner ring of the frame. With this *exclusive feature* Charavays are practically 100% efficient. Tests proved that a gap between the blade and frame caused the current to "backwhirl" and lose much of its force, so only Charavay Fans have this *patented overlapping blade*—and only Charavay Propeller Fans can give you Charavay's greatest air volume! They save 40% to 80% on power, are economical in price and easy to install.

Charavay Packing House Applications

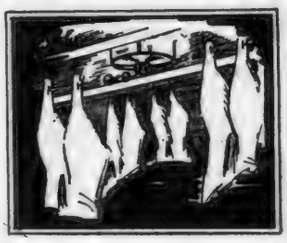
IN COLD weather packing houses and abattoirs have a steam condition in their scalding and scraping rooms that is troublesome. The colder the day, the thicker the steam. Charavay Fans will exhaust this steam, making conditions such that work can be done better and faster.



IN OTHER parts of abattoirs equalized heat is needed. Charavay Fans within two feet of ceiling, blowing down, will equalize temperature, making it the same at floor as at ceiling. Otherwise a difference of 10 to 15 degrees can be noted. Makes conditions comfortable and cuts down fuel bill.



CHARAVAY Fans in coolers create circulation of air and maintain even temperature. They should be installed in a vertical position about 18" from ceiling, blowing up. Such installations have saved the expense of costly cooler additions for many packers. (Our engineers will suggest proper sizes.)



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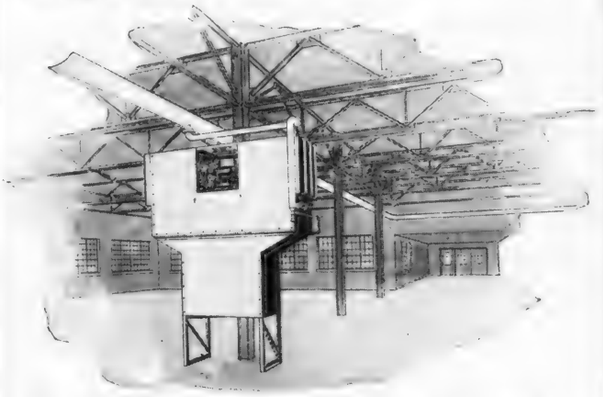
Hartzell Propeller Co. *Div. of Hartzell Industries, Inc.* 16 Craft Street Piqua, Ohio

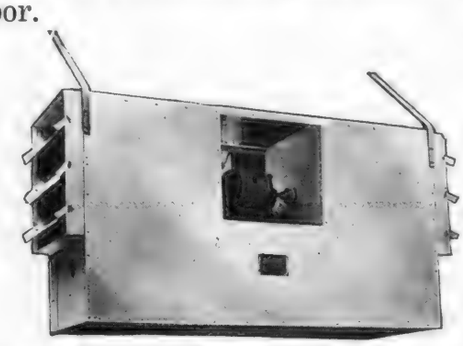
TWINFAN

UNIT HEATERS FOR EVERYWHERE

Small garage or wide-spreading factory—retail store or office building—there's a definite type of Twinfan for everywhere.



The Twinfan illustrated here (Type A) is designed to heat large spaces. It may be suspended from the ceiling or placed in a convenient location on the floor.

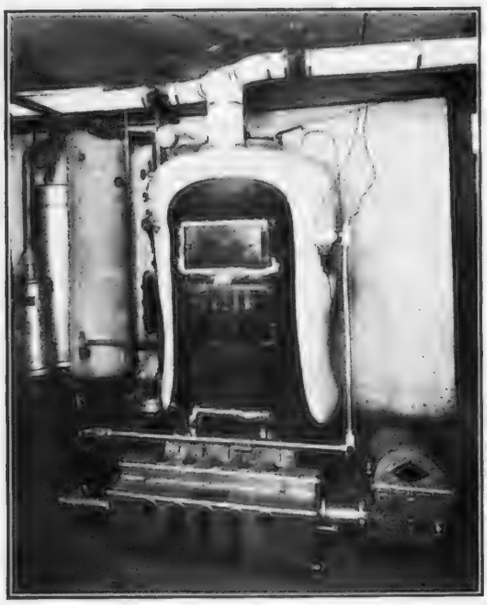


In the latter installation, the area of the floor stand is reduced to the exact size necessary for the air inlet, thus saving floor space.

Write for fully illustrated folder giving complete details and specifications of all Twinfans.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH TWINFAN UNIT HEATERS

Burners May Be Sold IN WINTER



Even in cold weather, when your customers' bins are filled with fuel, S & D Burners may be sold at a profit.

Only a few hours are required to complete an S & D Gas Conversion. Your customers suffer no inconvenience and are assured of a most efficient method of burning gas fuel.

Sweet & Doyle Foundry & Machine Co.
Troy, N. Y.

50 Church St., New York City
131 State St., Boston
2013 Sansom St., Philadelphia

Easier to Connect—Handier to Service

Barnes & Jones

New, Improved

Blast-Drip Trap

SMALL and compact yet with an extremely large capacity, this latest improvement in Barnes & Jones Heating Systems offers two outstanding and long-needed advantages—easy installation and accessibility for cleaning and servicing. Besides, it is adapted to a variety of uses. Designed primarily for use on drips from supply mains and risers, this new trap also can be used on the returns from water heaters and indirect stacks. It is applicable for any low pressure duty where there is no pressure on the discharge side of the trap.

It is a combination float and thermostatic trap, having a float-controlled valve governing the discharge of water and a thermostatically-controlled valve which allows the discharge of all air but prevents the passage of steam. Its 3½-inch float gives it more leverage, or power.

It requires practically no extra piping. Weighing only 14 pounds, it needs no supports—the piping itself is adequate. Inlet and outlet connections are near together. The trap can be connected up either right or left.

No matter where the trap is located, even if close to the ceiling, it is easy to service. It can be taken apart for examination, cleaning or repairs without disturbing any piping connections. Simply by removing four bolts, the body of the trap can be pulled away from the head so that all the working parts are freely exposed. No special socket wrenches are necessary. The thermostatic member, too, is removable and accessible.

Tapped in three sizes—¾-inch, 1-inch and 1¼-inch—these traps meet all the problems of installation, operation and servicing that our 30 years' experience in the development and manufacture of heating appliances has pointed out to us.

Barnes & Jones

The Sign B&J *of Quality*

Vapor and Vacuum Heating Systems of Proven Quality
Backed by 30 Years' Experience as Heating Engineers and Manufacturers

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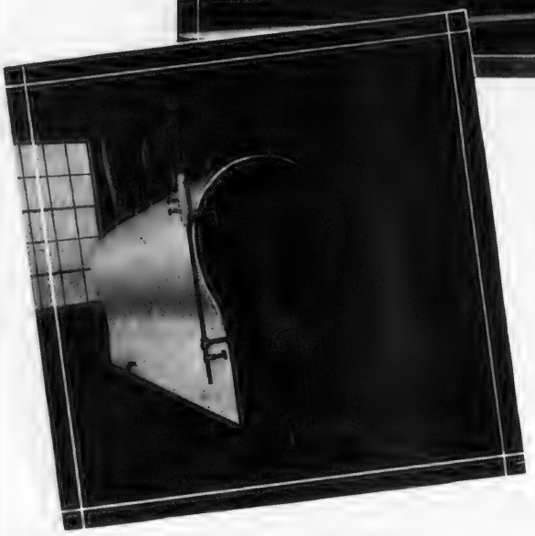

A MODERN BOILER FOR MODERN BUILDINGS

The Johnston Steel Heating Boiler is being installed in many new factories, offices, newspaper plants, bank buildings, schools and churches. Built of the finest material, simple in design, substantial in construction, efficient in operation and fully guaranteed, the Johnston Boiler is succeeding on merit.

Because the Johnston Boiler gives good service one installation leads to another and thus the boiler sells itself. We'll be glad to give you a list of users to whom you can write. It will pay you to get our proposition before you buy.

JOHNSTON BROS., Inc., *Boiler Specialists for Sixty-five Years,* FERRYSBURG, MICH

KENNEDY Radiator Valves

DESIGNED in accordance with standard roughing-in dimensions, and include every desirable type—angle, straightway, and offset corner, with or without unions, right or left hand, and with wheel or lock shield and key on operating stem. Kennedy Valves, Malleable Iron and Brass Fittings help to speed up pipe fitting jobs by their uniform excellence and ease of connecting up to pipe lines.

Kennedy Products are handled by local supply houses everywhere.

THE KENNEDY VALVE MFG. CO.
Elmira, N. Y.
Branches and Warehouses in Principal Cities

CHICAGO PUMPS

Used in the Leading Buildings of America

A Representative List of Modern Buildings Equipped with CHICAGO Pumps.

New Yorker Hotel	New York City
Roxy Theatre	New York City
Garment Center Building,	New York City
Daily News Building	New York City
Foreman National Bank	Chicago
Union Station	Chicago
Civic Opera	Chicago
Soldiers' Field Stadium	Chicago
Edgewater Beach Hotel	Chicago
Union Trust Bank Building	Detroit
Crowley-Milner Dept. Store	Detroit
Chevrolet Motor Co. [Foundry],	Saginaw
Foshay Tower	Minneapolis
Mayo Clinic	Rochester, Minn.
Elverson Building	Philadelphia
Mastbaum Theatre	Philadelphia
Schroeder Hotel	Milwaukee
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Illinois Electric Power	Peoria, Ill.
Saenger Theatre	New Orleans
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The Coliseum	Los Angeles
Dillon Building	Nashville
Smith Young Building	San Antonio
National Bank of Commerce	Houston
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Embassy Theatre	Atlantic City
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Gimbel Bros. Store	Pittsburgh
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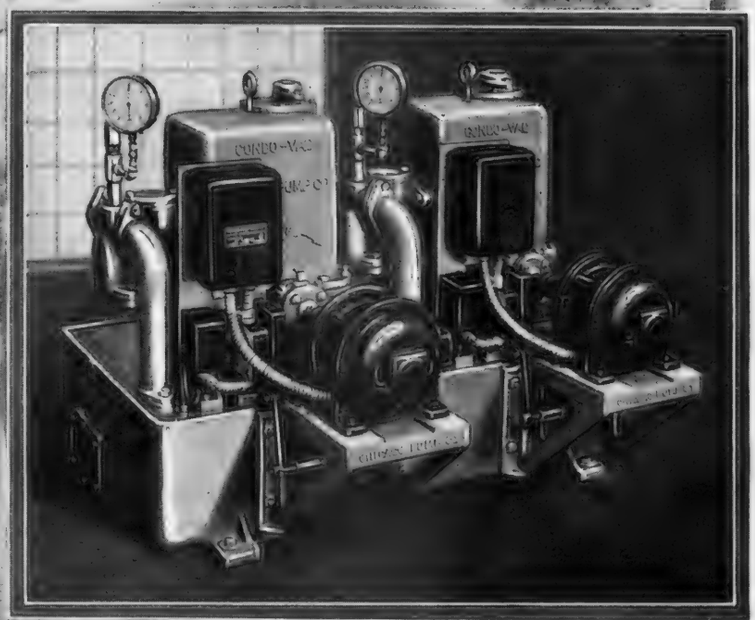
Lee Higginson Building	Boston
Elks Club	Boston
Waycross Com'nity Hotel,	Waycross, Ga.
Ford Motor Co.	Numerous Locations
Bell Tel. Companies,	Numerous Locations
Sears Roebuck St'rs,	Numerous Locations
General Motors Co.,	Numerous Locations

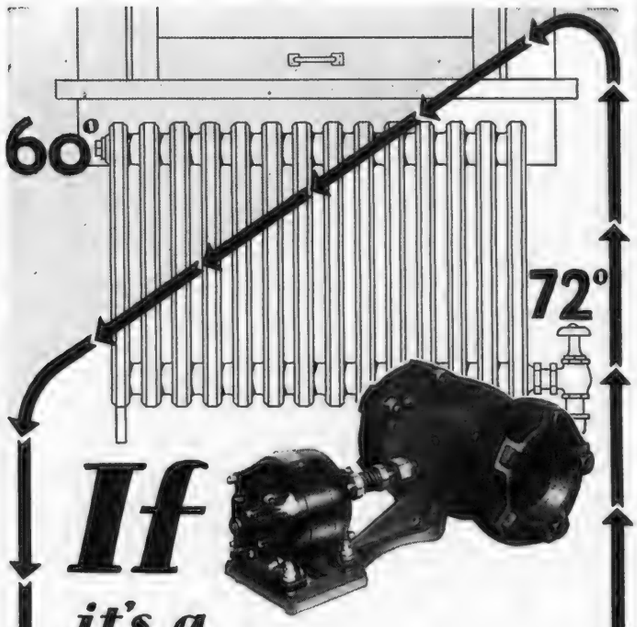


Duplex "Condo-Vac" Vacuum Pump.
A Typical "Chicago Pump" Product.

CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

2336 WOLFRAM STREET ... CHICAGO, ILLINOIS



If it's a **Hot Water System**

The Compeller
FOR HOT WATER HEATING SYSTEMS

will make a difference

CIRCULATION is the thing that wrings the heat out of a hot water system. Even on the best systems, forced circulation increases efficiency — and on sluggish ones it makes a world of difference.

It saves fuel
It speeds up heating
It makes "flexible heating"

A simple, quiet, unit—inserted in the return line. That's all. Easy to install, easily controlled and as long lived as your boiler.

Ask us about it.

STERLING ENGINEERING CO.
1644 Holton Street Milwaukee

Patterson
Hot Water Heaters will serve the New Lincoln Building

J. E. R. CARPENTER, *Architect* CLYDE R. PLACE, *Consulting Eng.*
J. L. MURPHY, INC., *Plumbing Contractors*
BAKER, SMITH & CO., *Heating Contractors*

The 53-story Lincoln Building, New York, has 927,000 sq. ft. of space and towers 678 ft. above the street.

Six Patterson Hot Water Service Heaters and two Patterson Preheaters installed in this building are designed to supply hot water for the 10,000 or more people which this gigantic structure will house.

In big expensive buildings—buildings where no chances can be taken on the hot water supply—you will usually find Patterson Heaters.

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Certificate of Quality

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Underground Conduit Insulation

WE CERTIFY that a specimen from this shipment of Ric-wiL DRY-PAC Insulation, manufactured by us, has been tested and that it is thoroughly and uniformly waterproof; that it did not show for a period of 24 hours any appreciable absorbtion of water when packed in a one inch glass tube at the density used in conduit and one end of this tube immersed in water, nor did the filler in the tube show within 24 hours any signs of water penetration with a 1" column of water standing on top of it in the tube. While for convenience tests are based on 24 hours, certificate, if desired, will be furnished by disinterested laboratory to the effect that all ingredients and water-proofing are of permanent nature and will not deteriorate.

WE CERTIFY that the thermal conductivity of this insulating filler has been tested and that it does not exceed 0.36 b.t.u.'s per hour, per square foot 1 inch thick, per one degree of difference in temperature between opposite faces when the mean temperature is 158° F.

WE CERTIFY that this insulating filler is free from corrosive action on iron or steel pipes under normal conditions.

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Certificate of test applying to this shipment is No._____

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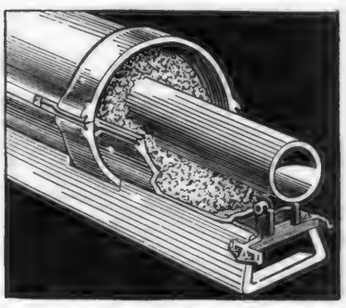

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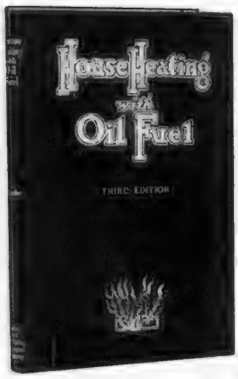

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Every reader of this magazine should be fully posted on the developments in the use of oil fuel in house heating; whether he is selling equipment for it, or meeting it as competition. There is no better source of information than this unbiased treatment of the entire field by P. E. Fansler, E.E. 150 especially prepared photographs, diagrams, and charts are used to illustrate it. A glance at the Table of Contents given below will show how comprehensive and up to the minute it is.

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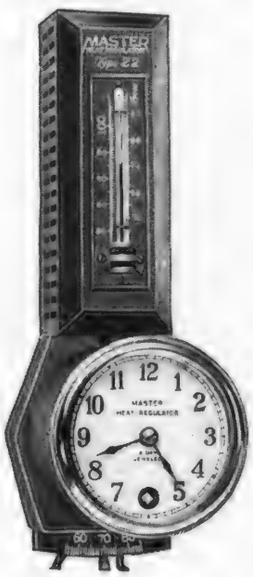

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This new Type 22 Master Plain model sells at the popular list price of

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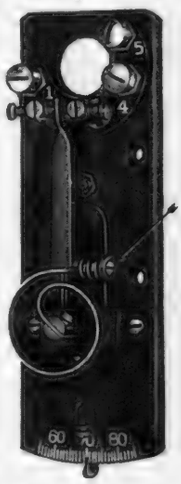

Type 22 Plain thermostat with case removed, showing the super-sensitive thermostatic blade. Nowhere at any price, can a more dependable regulator be found.

This is the Master Full Electric Motor which is furnished with all Master Heat Regulators.

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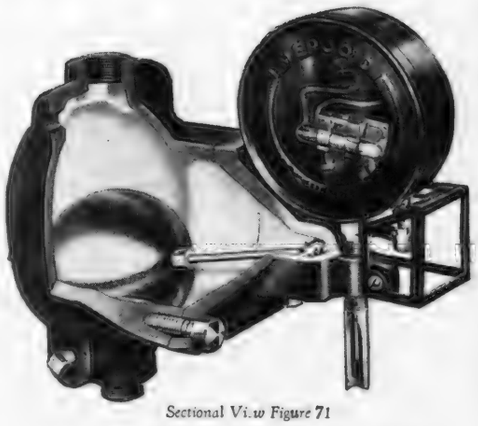

Sectional View Figure 71

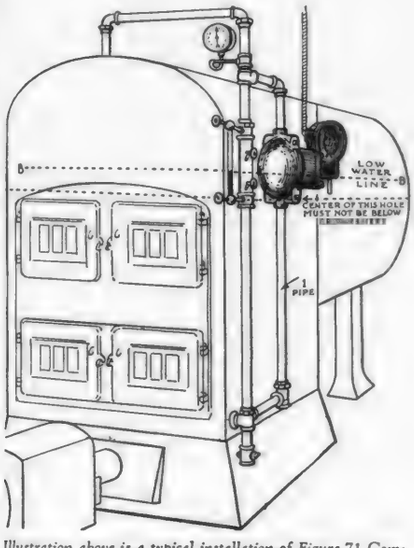

Illustration above is a typical installation of Figure 71 Combination Low Water and Pressure Switch. Note method of connecting to boiler, which insures proper operation.

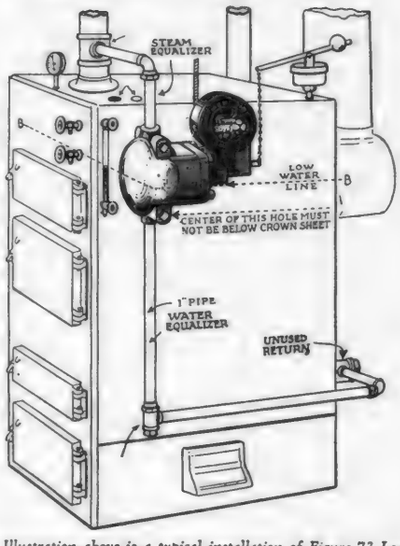

Illustration above is a typical installation of Figure 73 Low Water Switch in connection with diaphragm regulator for pressure control. Note—very close control is possible with this arrangement, at low cost.

Figure M-51

Protect the Warm Air Furnace—

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EVERY WORKING PART MADE OF SOLID BRONZE

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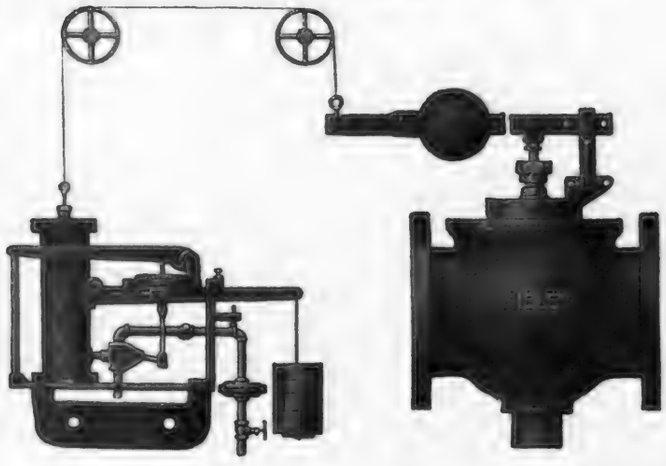

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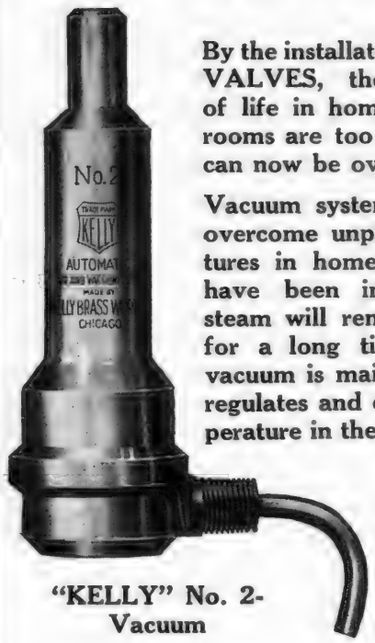

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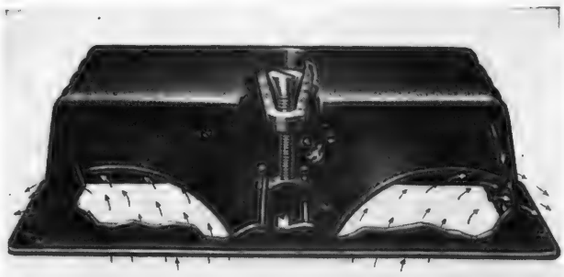

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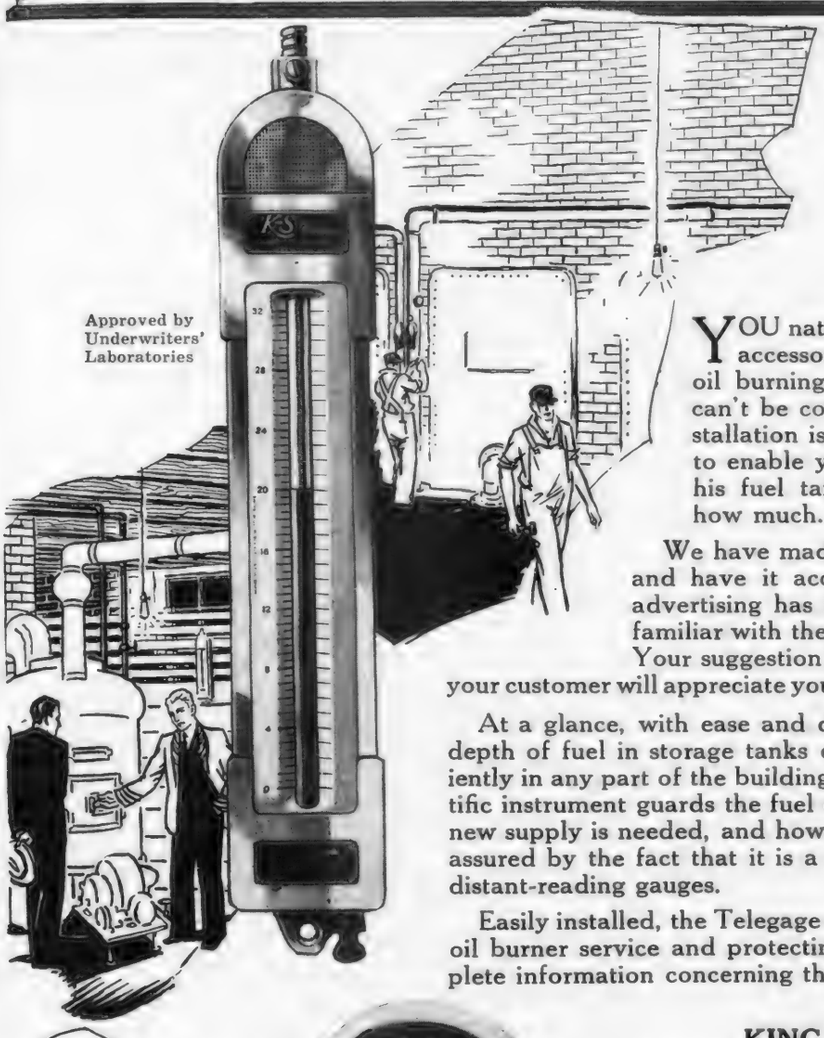

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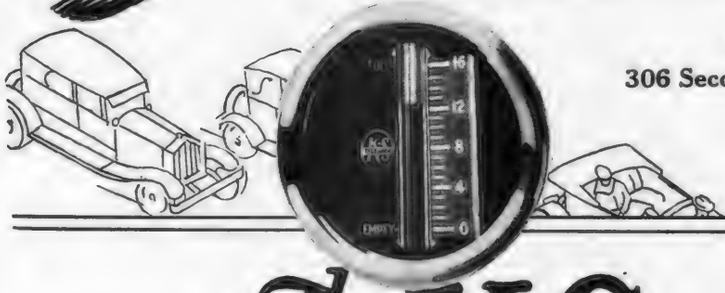

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I would like you to know that your Ideal In-Airid Vacuum Valves are highly satisfactory. They not only improve the appearance of the radiator, but they are efficient in performance. These valves on the radiator together with the #822 Vac Vent Valve on the end of the main have enabled us to hold a vacuum for even longer than twenty four hours.

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Yours very truly,

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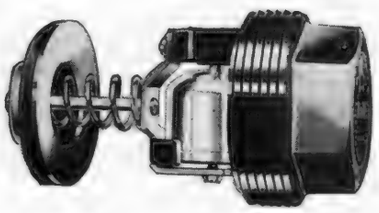

The In-Airid shown above was specially designed to vent new water radiators when used on steam. It prevents the short circuiting of steam across the top openings and insures complete venting of all air. This valve is the one sure means of avoiding venting troubles on your new steam jobs.

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The Invisible AIR VALVE

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Airids No. 500 and Vac-Airids No. 510 are still the best valves to use for replacement on old style steam radiation.

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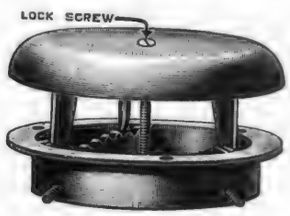

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NU-NOTCH is Simple, Rigid and Easily adjusted in recessed notches. For any kind of floor. Also flat tops for low seats, and steel ring for sleeve.

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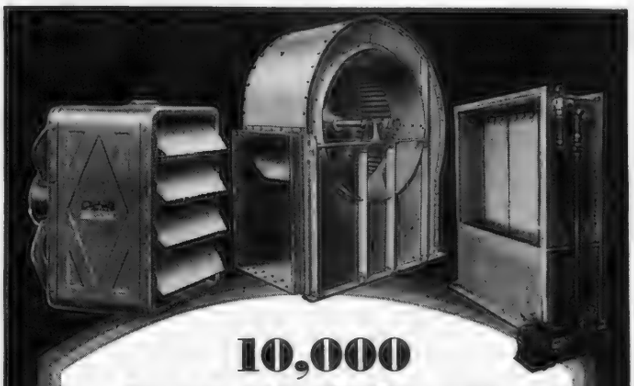

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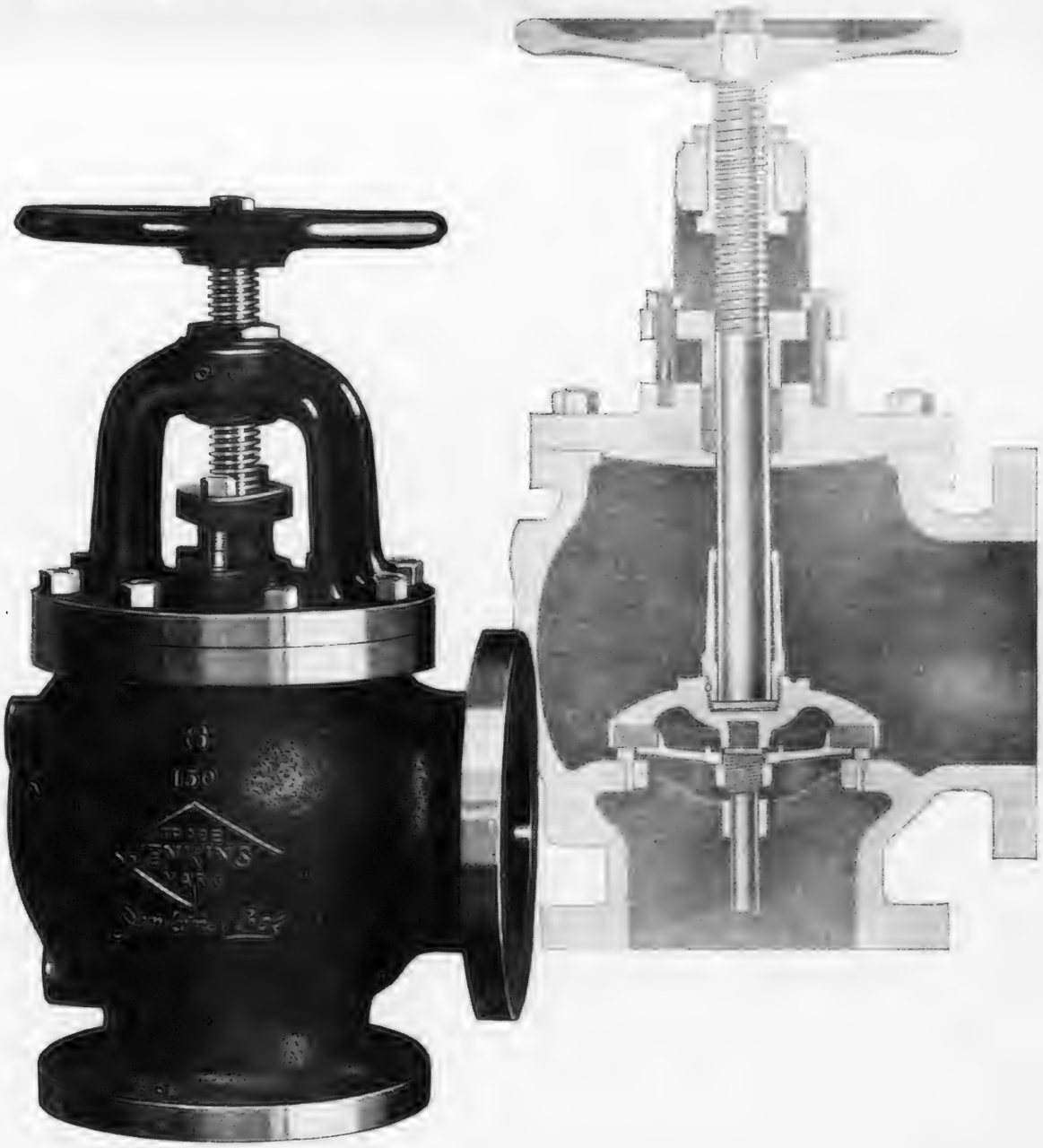

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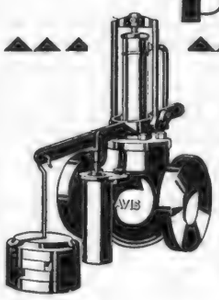
Below: Interior of the Metal Aircraft Corp. Bldg., Cincinnati, O., heated by "Sterling" gas-fired unit heaters, using 385 cu. ft. of 900 B.t.u. mixed gas per hour and having a total heat delivery of approximately 2,100,000 B.t.u. Offices heated by "Sunnyaire" Heat Cabinets.

REGULATE PRESSURES



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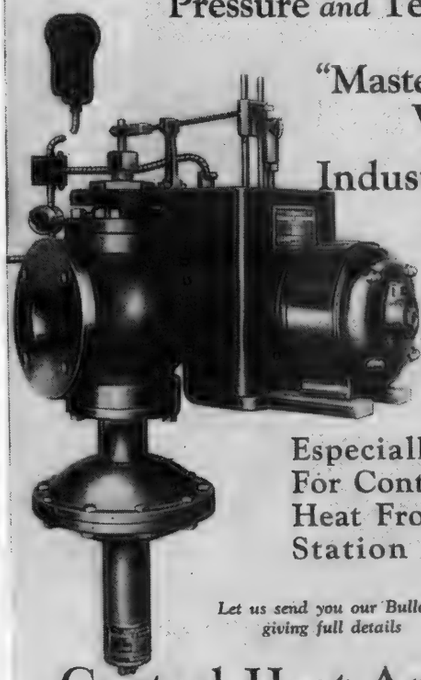
Industrial Type



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A New Bayley Bulletin
Is Ready For You!

A NEW BAYLEY BULLETIN, containing complete information on Bayley Chinookfin Heaters, is now ready for you. To the engineer or executive who has the responsibility of selecting or specifying indirect heaters for heating, ventilating, air conditioning, process drying, tempering coil or other service, this new bulletin will prove a valuable reference book.

Chinookfin Heaters possess remarkable features; a copper indirect radiator as safe for tempering coil service as for reheaters — a single header divided into steam and return chambers — individual radiating tubes with individual feed through individual circulating pipes. Write for Bulletin No. 29-C which describes the Chinookfin in detail.

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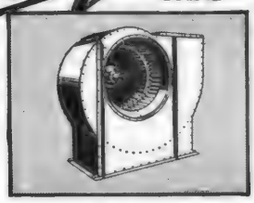
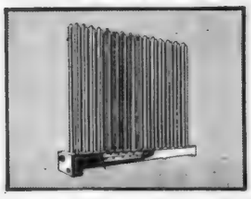
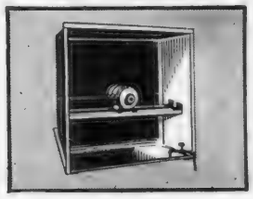
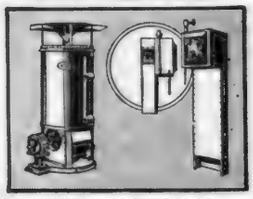
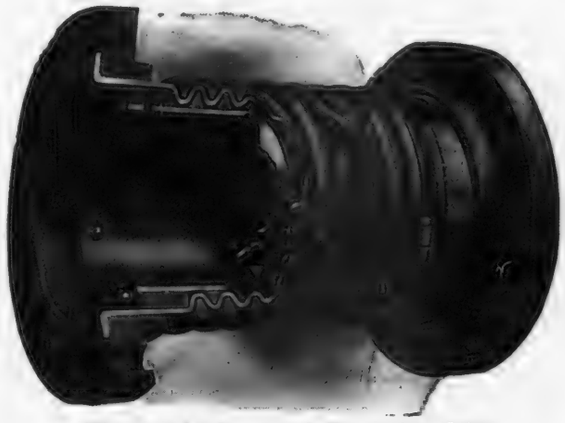





HEATING — VENTILATING — AIR CONDITIONING — PROCESS DRYING — MECHANICAL DRAFT — EXHAUST

Wainwright Joints for Pipe Line Expansion

There is no more effective method of taking up the expansion in pipe lines carrying steam, hot water or oil, than by means of the Wainwright expansion joint.



Wainwright Improved Expansion Joint

The Wainwright joint has no packing. Expansion of the pipe line is absorbed by a seamless, corrugated copper tube. Rings fitted inside and outside of the corrugations distribute the pipe movement and each corrugation accepts a portion of the total expansion.

An inside protecting sleeve of the Wainwright joint protects the copper expanding portion from high velocity steam and reduces the friction loss, or resistance to flow, through the joint.

Wainwright joints are built for 150 lb. working pressure in sizes 3 to 14 in., and for 125 lb. working pressure in sizes 16 to 24 in.

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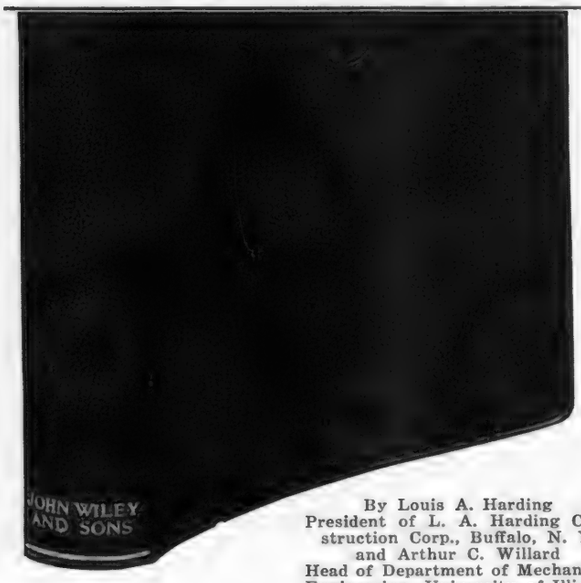

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and Arthur C. Willard
Head of Department of Mechanical Engineering, University of Illinois

For over twelve years this book has been considered by those who know to be the outstanding treatise in the heating and ventilating field. The reason is clear—it is the most up-to-date, complete and authoritative book now available.

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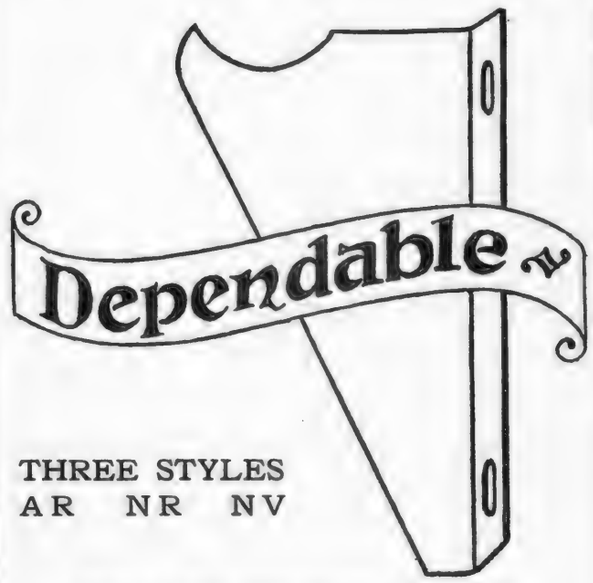

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is the outstanding American achievement in Heating and Humidifying. It is a sturdily constructed unit which is the ultimate in simplicity of operation. Once installed it needs no further adjustment, yet a close regulation of heat in the room can be attained by means of a controlled damper. The proper amount of humidity for health and comfort is automatically supplied. Its ease of installation is a most important feature.

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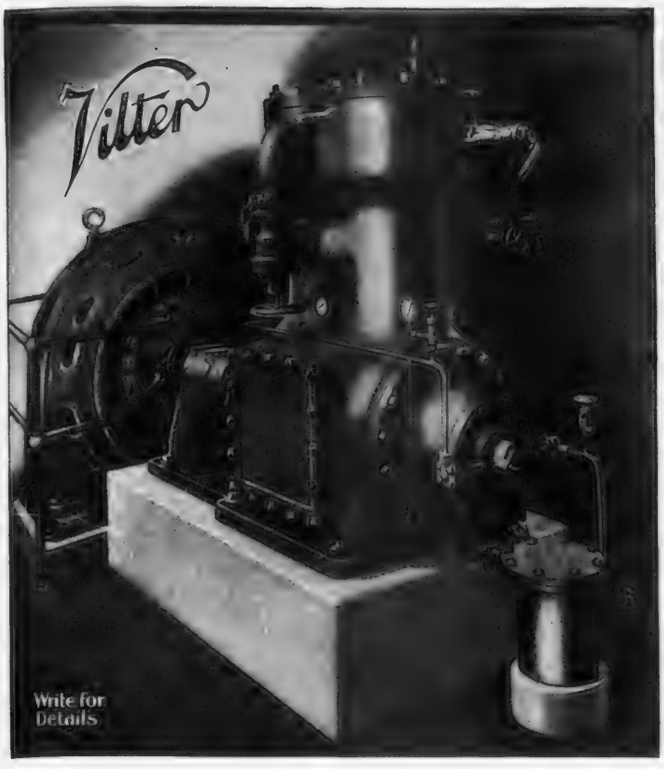

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And.....to Vilter the "right answer" means the 100% right result with low cost of installation, lower operating expense and lowest upkeep.

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For an authoritative solution of your refrigeration problems consult our Engineering Department.

41-29

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The Whole Line of
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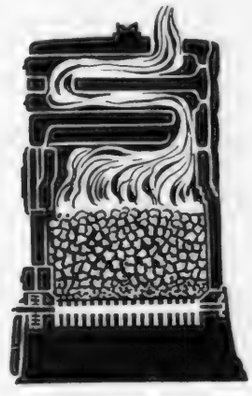
For Every Heating Purpose

Lasso The Dollars For You

Use the Burnham to rope them. It will drop your little old sales lasso right over those dollars you are riding so hard and fast for.

We can prove it. Want the proofs?



Every Burnham, round or square, has this loop of long fire travel to catch and hold the heat. Which is just one of their economy features.

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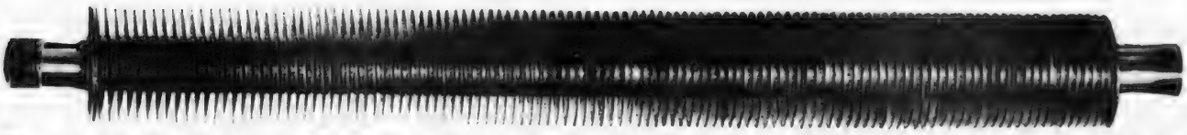

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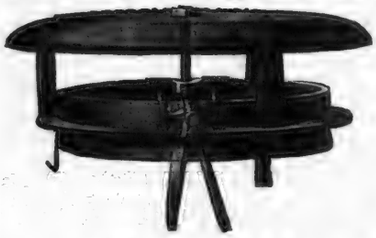

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cleans the air twice

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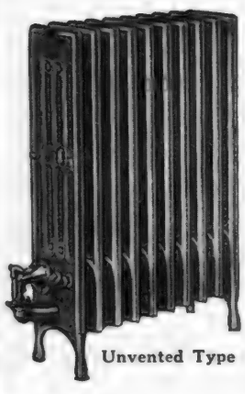

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There is no heating apparatus on the market today that equals the Automatic Gas Steam Radiator in convenience and comfort. They afford steam heat, which is universally known as the best means of heating. They are automatically controlled. There is no boiler, no dirt, no labor, and heat when and where you want it by simply striking a match.

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AUTOMATIC GAS STEAM RADIATOR CO.

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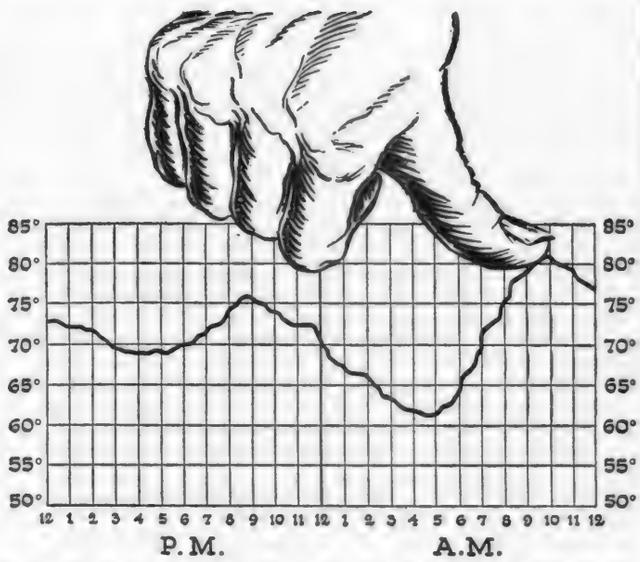

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The Thermotrol

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Outside temperature and winter winds do not treat all rooms alike. Heating requirements vary in each room as often as the wind changes.

The control of individual radiators with Thermotrols gives constant temperature regardless of outside temperatures. There is no unhealthful overheating and no shivery chill where Thermotrols are used.

Each radiator is an independent unit, exactly controlled by the self contained Thermotrol.

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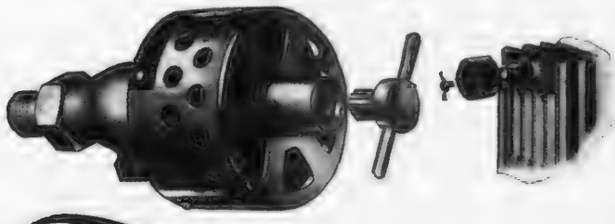

The Thermotrol

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The Modern Heating Unit for Steam, Vacuum, Vapor and Hot Water Heating

Completely concealed within the walls.

Attractive enclosures which can be finished to harmonize with the decorative features of the room.

Seamless hard drawn copper tubing. Copper fins are an integral part of tube. No welding, soldering, or tinning in any part of FINTUBE.

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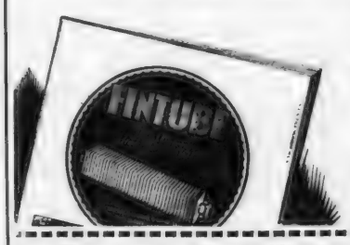

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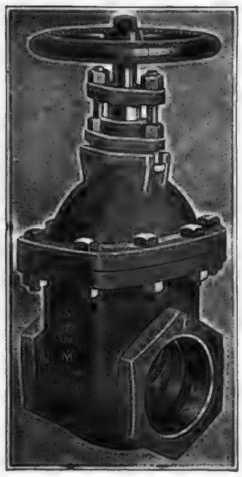

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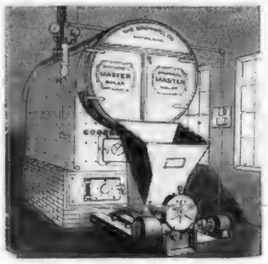
BROWNELL

ELECTRIC WELDED
HEATING BOILERS



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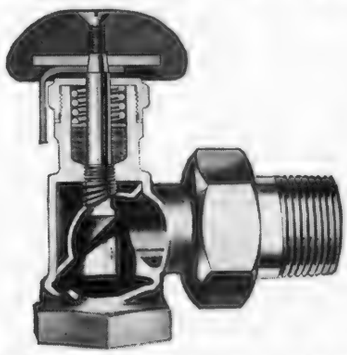
It actually Costs Less to install these ARCO PACKLESS VALVES



ARCO PACKLESS HOT WATER VALVE No. 901

EVERY progressive heating contractor knows that ARCO Packless Valves save money for the owner by insuring against leaks.

But there are many who do not realize that the No. 901 actually costs the contractor less, and the reason for this is very simple. Investigations have proved that on the average ten radiator job the cost of the return trip to repack ordinary valves before the job is turned over to the owner is at least $3.50.

The difference in cost between ARCO Packless Hot Water Valves and the cheapest valves on the market is much less than that.

And all during the long life of the No. 901 the user has a smooth turning, good looking, dependable and stick-proof valve, and a perfectly balanced job—because of the exclusive equalizing feature.

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—One of a complete Packless line for Steam, Water, Vapor or Vacuum, made in Angle, Corner, and Gate patterns.

AMERICAN RADIATOR COMPANY

Makers of a complete line of VALVES, VENTS *and* REGULATORS

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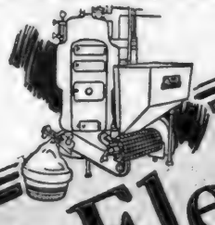
The ELECTRIC FURNACE-MAN is the most industrious of all the *electric servants* in the home, for he works night and day unceasingly—feeds coal, removes ashes, maintains uniform heat throughout the house and supplies hot water.

Provides AUTOMATIC HOME HEAT with absolute SAFETY—CLEANLINESS—DEPENDABILITY—HIGHEST EFFICIENCY and MAXIMUM ECONOMY.

The ELECTRIC FURNACE-MAN burns Anthracite in the economical Buckwheat sizes. There are no drafts to regulate—no grates to shake. There is no smudge, smoke or odor. The entire equipment is self-contained and compact — no unnecessary weight — sturdy, fool-proof and reliable. Quickly adapted to any heating plant—steam, vapor, hot water, warm air, at remarkably low cost. Thousands of satisfied customers. Endorsed by Anthracite Operators' Conference.

See demonstration. Distributors and dealers in over 300 cities. Write for attractive, illustrated booklet.



The Electric Furnace-Man

PATENTED AUTOMATIC COAL BURNER

DOMESTIC STOKER COMPANY
Gillespie Bldg. 7 Dey St. New York

Low Water Line Control
plus
Maintained Efficiency

Low Water Line Control without pitting is made possible with the Skidmore Vacuum Pump on its interceptor base, because the water level in the base is only 12" from the floor when the float-actuated switch starts the pump and returns all condensate to the boiler.

Maintained Efficiency is assured because the vacuum-producing rotor is of the enclosed type and has such a liberal clearance that grit and scale from the heating system will not cause wear between the moving parts. Lack of wear guarantees Maintained Efficiency.

Ask for Bulletin No. 6 for full details of Skidmore Vacuum Pumps

Low Water Line Control is also accomplished in the design of the Skidmore Condensation pump, and in addition note the compactness and accessibility, which mean minimum floor space occupied and ease of dismantling without disturbing piping.

Bulletin No. 7 gives you full details.

SKIDMORE CORPORATION

General Offices and Factory: 1535 Dayton Street, Chicago
REPRESENTATIVES IN PRINCIPAL CITIES
Canadian Representatives: Darling Bros., Ltd., 120 Prince St., Montreal

G&O FINNED TUBING
Quality Service

WE are splendidly equipped to supply all types of finned tubing for copper radiation.

CORRESPONDENCE INVITED

THE G & O MANUFACTURING COMPANY
New Haven, Conn.
Established 1915
Manufacturers of the famous "G & O" Radiators for automotive vehicles

CRANE CAST STEEL AND FORGED STEEL ARE SUPER-STRONG VALVE METALS

CRANE

THEY SAFELY CONTROL HIGHEST PRESSURES AND TEMPERATURES

Oil Burner Installations Made Faster, Better with "Extra Heavy" Copper Tubing

Fast delivery. Send for data and prices.
Also Specifications on "Unit Heaters"

WOLVERINE TUBE CO.
SEAMLESS COPPER BRASS & ALUMINUM
1415 Central Ave. Detroit, Mich.

THERMO SYPHON TRAP

IN THE FALL the Home-owner's fancy definitely turns to thoughts of Heating. This is the opportune moment for the Engineer and Contractor to investigate the advantages to be found only in a Thermo Syphon Trap. Heating plants are being installed,—others are being renovated,—yet others need the dependability of Thermo Syphon Traps. There is a veritable gold-mine of profits in this season.

Send for our Bulletin No. 16 H-V.

We solicit your correspondence on heating difficulties.

THERMO SYPHON TRAPS are especially designed to handle condensation from any type of one or two pipe steam heating system with a pressure or vacuum not exceeding twenty pounds boiler pressure. The elimination of water-logged or air-bound conditions and resultant improvement in circulation safeguards any type of vapor or atmospheric system.

LYTTON MANUFACTURING CORPORATION
FRANKLIN, VIRGINIA

HEAT YOUR BUILDING WITHOUT COST

BY BURNING DISCARDED CRANKCASE OIL
AFTER PASSING THROUGH THE
NUGENT CRANK CASE OIL FILTER

NO MORE BURNER TROUBLES

WRITE FOR CATALOG ON
OIL FILTERS—OILING SYSTEMS—OILING DEVICES—OIL PUMPS

Wm. W. Nugent and Company
ESTABLISHED 1897
409 North Hermitage Avenue
CHIGAGO, ILLINOIS

ELEVATION FIG. 1078

MONARCH GARAGE
1122-1130 HOLLYWOOD AVENUE AT THE L
CHICAGO, ILL.

Wm. W. Nugent & Co.
Chicago,Ill.

December 19,1927.

Gentlemen:-

About a year and a half ago we purchased from you a Nugent Oil Filter and motor driven oil pump to filter automobile crank case oil for our oil burner.

This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

Cleaning the filter requires only ten minutes twice a week and there is no other upkeep to the filter, as the filtering elements will last for years without renewing.

We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

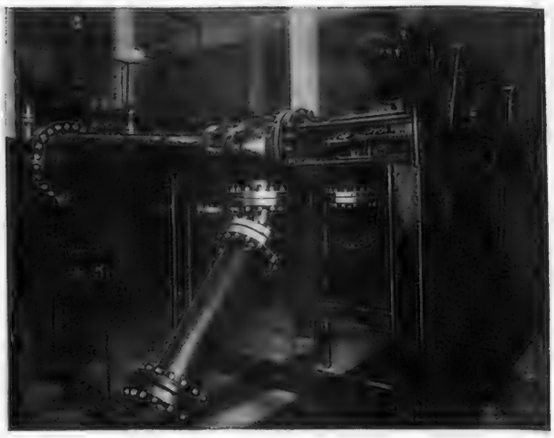
NUGENT TRADE MARK

MONARCH GARAGE
BY E. L. [illegible]

THE FACT AND THE PROOF

VENTURI REDUCING VALVES for district heating plants

Motor operated flow regulating valve, expansion nozzle for pressure reduction, automatic control for valve motor. Built for low, medium and high pressures.



The two 10" x 20" valves pictured are at the Baltimore Ave. Heating Plant of the Kansas City Power & Light Co.

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VAPOR-VACUUM
RADIATOR AIR VALVE

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THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

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Positive and Dependable Thermostatic Metals

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MANUFACTURERS OF

Cadillac Condensation Meters
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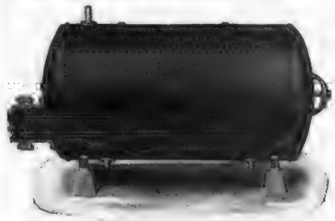
Packingless Expansion Joints and other special fittings for underground steam distribution mains.

Alberger Buffalo Heaters

are built for a great variety of standard and special operating conditions for heating water with steam or for the interchange of heat from one liquid to another.



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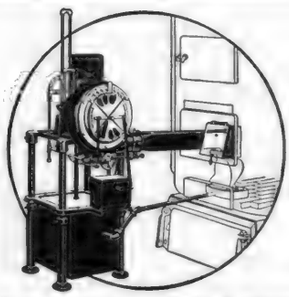

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Continuous Flame Dependable Heat

No Gas Pilot · · No Electric Ignition
Graduated Automatic Control
Mechanical Draft

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The KAINER PRESSURE GOVERNOR

for Hot Water Heating Systems

More and more plumbing and heating contractors and engineers are recommending and installing the KAINER Pressure Governor in place of expansion tanks and fittings on their hot water layouts.

The overwhelming nationwide acceptance of the KAINER during the past few years affords ample proof of the sound engineering principles that characterize the design and construction of this dependable Governor.

The KAINER Governor reduces the cost of a hot water layout, simplifies installations, makes a better job, saves your time and your customer's money, increases your profits and builds good will.

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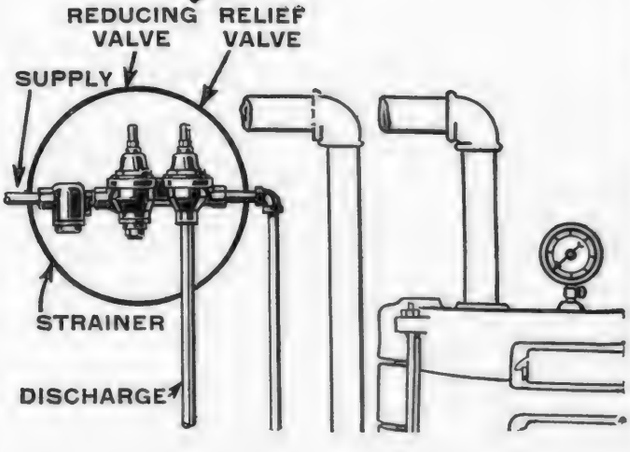
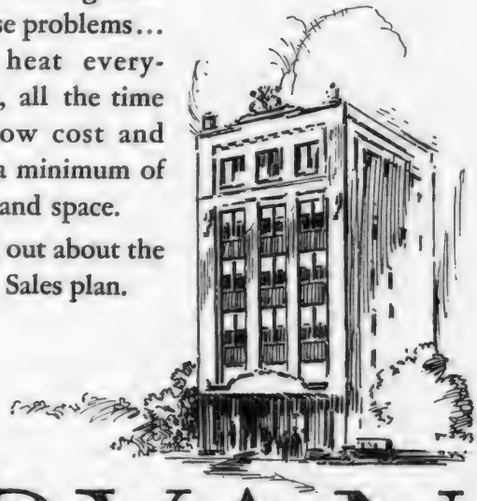


COSTS LESS TO OPERATE

IN most office buildings, rental is based on specific charges per square foot of floor space. The revenue to the owner is easily calculated but it is another matter to figure the actual net profit. Two things enter into the picture very forcibly—keeping the space constantly rented—and—holding the overhead to a minimum. Bryan Boilers are a big ally in solving both of these problems... even heat everywhere, all the time at a low cost and with a minimum of labor and space.

Find out about the Bryan Sales plan.



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STEAM CORPORATION
BOILER DIVISION
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MANUFACTURED WEATHER

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See our detailed data in A. S. H. & V. E. Guide.

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"Every day a *good* day"
Air Conditioning

Humidification, Dehumidification
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Cooling of Public and Industrial Buildings
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SALES OFFICES

New York, Philadelphia, Boston, Chicago, Cleveland, Detroit, Washington, Kansas City, Dallas, Los Angeles

Literature on request. Write concerning your specific problem.

ROSS

Crosshead-GUIDED Expansion Joint Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
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Heaters
Reclaimers
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Our time and effort are devoted exclusively to the design and manufacture of equipment for the transfer of heat from one liquid or gas to another. Our staff of engineers and specially trained representatives is at your service to solve problems of this nature.

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For Pipe and Pipeless Furnaces
(4 Sizes)
For Steam or Hot Water Radiators
(4 Sizes)

Most efficient, durable and sanitary Humidifiers made.

GUARANTEED

Good profit. Easy to sell and install. Write for catalog, prices and discounts. Address Dept. H.V.

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Established 1908

FITZGIBBONS
the STEEL BOILER with fast pick-up

Types for any FUEL—any SYSTEM
300 to 36,000 sq. ft. steam radiation.
"The BEST in Steel Boiler Heat"

Full details in the Steel Heating Boiler Catalog—Write for a copy today

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United States Ozone Company of America

Manufacturers and Engineers
ESTABLISHED 1910

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USOZONE
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"United States Ventilating Ozonizers"

Let us send you our Bulletins Nos. 41 and 54 *Factory and Sales Office,* SCOTTDALE, PENNA.

Game's Over!
Now for the showers!

The best run of all for winner or loser is the dash for the showers. Oceans of steaming hot water waiting to soothe battered bodies—to warm the idle scrubs. Peak load now on heaters that must deliver and there's none better for the purpose than National Storage Heaters. Many colleges now depend on them. You'll find they will do all or more than specified.

Make your next installation with National Heaters. Write for prices, and Bulletins 55, 57, and 65.

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Storage U BEND TYPE Heaters

THE NATIONAL PIPE BENDING CO.
Established 1883
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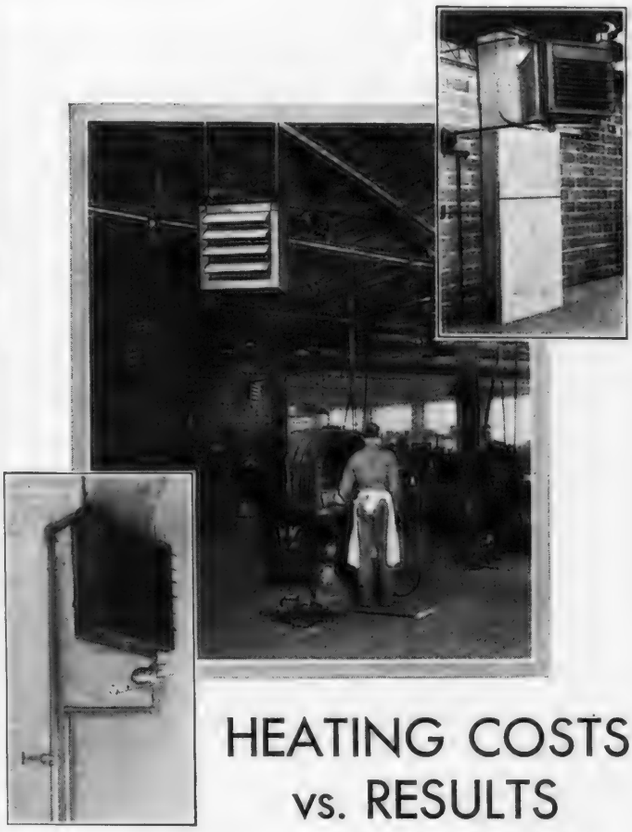
Used in Colleges, Hotels, Clubs, Apartment Houses, Y.M.C.A.'s, and Schools.



HEATING COSTS vs. RESULTS

Generally, improvements of all kinds involve the important consideration "Are the added advantages worth the additional cost?" This is particularly true in selecting heating equipment. Trane Unit Heating, however, is different because, with its many advantages, it costs 30 to 40% less than cast iron or pipe coil radiation. It provides healthful and comfortable warmth. Because of the scientific distribution of heat, fuel savings as high as 25% have been effected. Steam at either high or low pressure can be utilized without the need of reducing valves. Unusually quiet operation is obtained. Besides, it is a year 'round investment, giving good circulation of air for summer ventilation purposes.

When analyzing these factors and considering the small maintenance costs to be expected with the Trane patented heating element construction, a Trane Unit Heater installation is, without a doubt, the logical choice not only for new buildings but where a partial or complete change over from direct radiation is contemplated.

It will pay you to get all the facts on Trane Unit Heating. Send the coupon for our new booklet on "How to Cut Heating Costs."

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TRANE
UNIT HEATING SPECIALISTS

THE TRANE CO., Dept. 11,
206 Cameron Ave., La Crosse, Wis.
Send free booklet on "How to Cut Heating Costs."

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Address.....

City..... State.....

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Powers Regulator Co., Chicago, Ill.

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Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
U. S. Ozone Corp., Scottdale, Penn.
Vilter Mfg. Co., Milwaukee, Wis.
Woodward Co., Frank E., Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
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Dunham Co., C. A., Chicago, Ill.
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Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

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National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Louisville, Ky.
Staynew Filter Corp., Rochester, N. Y.

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Swartwout Co., Cleveland, Ohio.

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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
New York Blower Co., Chicago, Ill.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
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National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
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International Boiler Works, E. Stroudsburg, Pa.
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International Boiler Works, E. Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Monitor Boiler Co., Philadelphia, Pa.
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Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
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Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

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COOLERS, OIL
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Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

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Foster Wheeler Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
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(See Regulators, Damper).

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Johnson Service Co., Milwaukee, Wis.
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(See Air Cooling & Drying Systems).

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Carrier Engineering Corp., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

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Frost Mfg. Co., Galesburg, Ill.
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Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

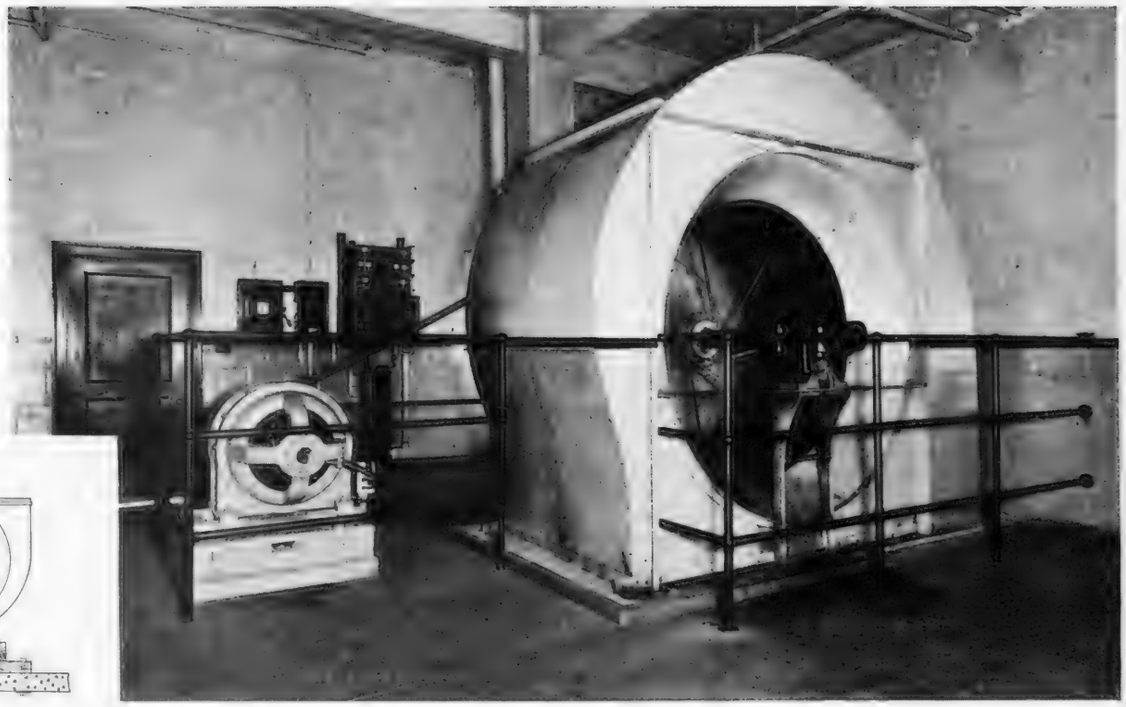
PRESSURE
De Bothezat Impeller Co., New York.

FANS, PROPELLER
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

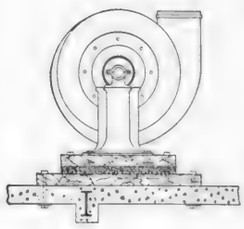
FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.

YOU CAN ISOLATE VENTILATING FANS AND MOTORS THIS WAY



J. L. HUDSON CO., *Detroit, Mich., has ventilating motor on wood base with 2" of Machinery Isolation, and ventilating fan on 2" of Machinery Isolation on concrete base.*



It is easiest to reduce noise and vibration when moving machinery is properly protected

VENTILATING fans and motors *will* shake and quake. But the ill effects of vibration and noise can be avoided if the machinery is cork-cushioned. This is equally true of other moving machinery.

Armstrong's Cork Machinery Isolation deadens vibration and noise. It eliminates the annoying "machinery hum," a common cause of complaint in office and apartment buildings and factories. It protects the building structure from strain and it promotes operating efficiency.

Armstrong's Cork Machinery Isolation is particularly adapted for this work. Made in three different densities and seven thicknesses, the material affords an exact adjustment to, and an effective remedy for, almost any operating condition. Since cork takes no "set" even under sustained compression, it keeps its resiliency after years of service.

Armstrong's Machinery Isolation does not deteriorate or disintegrate. For a few dollars—the cost is very reasonable—you remove permanently a serious and costly drawback to efficient operation.

Armstrong engineers will gladly recommend the proper thickness and density for your particular needs. This places you under no obligation. Write to the Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Penna.

Especially Serviceable

Armstrong's Cork Machinery Isolation may be installed with the most satisfactory results for: air compressors, blowers, drill presses, drop hammers, elevator hoists, engines, fans, forging machines, machine tools, motors, printing presses, pumps, punching machines, refrigerating machines, vacuum cleaners, and similar apparatus.

Armstrong's Cork Machinery Isolation

Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER

Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.
Watts Regulator Co., Lawrence, Mass.

FILTERS, CRANKCASE, OIL

Nugent & Co., W. W., Chicago, Ill.

FILTERS, (AERATING)

Davis Engineering Corp., New York.

FILTERS, FEED-WATER

Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, COMPRESSION PIPE

Nugent & Co., W. W., Chicago, Ill.

FITTINGS, PIPE, FLANGED

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES

Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS (CONVERSION TYPE)

Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Sweet & Doyle Co., Troy, New York.

GASKETS, ASBESTOS

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, DRAFT

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK

King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING

Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING

Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR

Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY

Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS

(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM

Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn

HEATERS, ELECTRICAL UNIT

American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
Watts Regulator Co., Lawrence, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)

Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Stanwood Corp., Cincinnati, Ohio.

HEATERS, FUEL-OIL

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT

Air-Way Electric Appliance Corp., Toledo, Ohio.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
De Bothezat Impeller Co., New York.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATERS, UNIT GAS FIRED

General Gas Light Co., Kalamazoo, Mich.
Texo Heater & Mfg. Co., Covington, Ky.

HEATING SYSTEMS, VACUUM

Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR

American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Savo Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Watts Regulator Co., Lawrence, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING

Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.

(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING

Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER

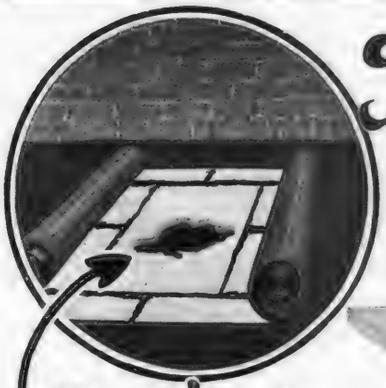
Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS

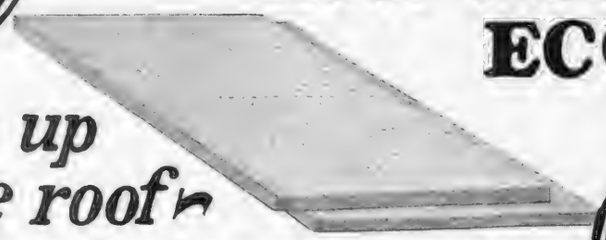
American Blower Co., Detroit, Mich
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

INSULITE

the Wood-Fiber Insulating Board



The SHIP LAP EDGE is the "Short Cut" to Roof Insulation ECONOMY



Don't rip up the entire roof

Simply replace the damaged unit

INSULITE Roof Insulation is built with a ship lap edge, and in units of convenient size (17"x34"). When applying the insulation on a roof, these units are bonded and moisture sealed with pitch or asphalt. If at any time during the life of the roof, one of the sections should become damaged, moisture cannot seep from this unit into adjoining ones and thus ruin the insulation of a large area. The damaged section can be easily and economically repaired without disturbing the other portions of the roof.

Furthermore, the ship lap edges of Insulite are not butted—they overlap, making a sealed bond—eliminating uninsulated spaces —preventing heat loss and moisture condensation.

Insulite Roof Insulation is built of two layers of standard ½ inch thick Insulite, firmly stitched together with non-corroding steel wire. This makes Insulite Roof Insulation a full 1 inch thick—which means 12½% more efficient insulation than ordinary ⅞ inch insulating boards.

Insulite is an all wood product, chemically treated to resist moisture, and is not subject to deterioration. Insulite is strong and sturdy, which makes it easy to work with—without loss due to breakage, and is truly the "short cut" to roof insulation economy.

LET US SEND YOU THIS BOOK--IT'S FREE

The Engineering Department of The Insulite Company has prepared a booklet—"Roof Insulation and the Prevention of Condensation." It contains much valuable data. We will send you a copy free —and remember, our Engineering Department is at your disposal at any time. You are obligated in no way.

THE INSULITE COMPANY
(A Backus-Brooks Industry)
1200 Builders Exchange, Dept. 29K
Minneapolis, Minnesota

Insulate with

FULL ½ INCH THICK
RESISTS
COLD-HEAT-NOISE

INSULITE
the Wood-Fiber Insulating Board

OFFICES
IN ALL
PRINCIPAL CITIES

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
McIlvaine Burner Corp., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Ames Pump Co., New York.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATION, LIGHT WEIGHT, NON FERROUS
American Radiator Co., New York.
McQuay Radiator Co., Chicago, Ill.
The Herman Nelson Corp., Moline, Ill.
Rome Brass Radiator Corp., New York.
Rome Turney Radiator Co., Rome, N. Y.
Thermal Units Co., Chicago, Ill.
Trane Co., The, La Crosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATOR ENCLOSURES AND SHIELDS
McQuay Radiator Corp., Chicago, Ill.
Schleicher Inc., Gary, Ind.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS, CABINET AND CONCEALED
Air-Way Electric Appliance Corp., Toledo, Ohio.
Fintube Radiator Co., Long Island City, N. Y.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Richmond Radiator Co., New York.
Rome Brass Radiator Corp., New York.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS, GAS FIRED
Automatic Gas Steam Radiator, Pittsburgh, Pa.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicgao, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines, Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.

130,000 sq. ft. of Celotex Roof Insulation Board used on flat and saw-tooth sections of roof of Hibbard, Spencer, Bartlett & Company building, Chicago. Wm. Murdock Co., Chicago, roofers. Graham, Anderson, Probst and White, Chicago, architects. Celotex roof insulation saves fuel, reduces radiation, and prevents ceiling condensation.

Reduce Heat Losses!

Celotex Roof Insulation Board retards heat leakage and lowers fuel consumption

THE heating plants you design and install will give more satisfactory service under a roof insulated with Celotex.

For Celotex protects top floor rooms against extremes of heat and cold, provides much greater comfort for those inside, and assists in securing good ventilation.

Celotex also retards heat leakage through roofs, thus lowering winter fuel consumption.

Celotex is made from long, tough cane fibre, firmly interlaced and felted into a strong, rigid board.

The thermal conductivity of Celotex Roof Insulation Board is remarkably low—0.33 B.t.u. per hour, per square foot, per degree Fahrenheit, per inch of thickness. It comes in boards 2′x5′, approximately ½″ thick. Applied in two or more layers, it effectively insulates any type of roof.

Celotex also helps to reduce ceiling condensation, and lessens the danger of expansion and contraction of roof decks.

Both warm and cold air ducts can be effectively insulated with Celotex Industrial Insulation Board. It is more efficient than other air duct insulators,—costs less and is easier to apply.

Safeguard your reputation as a heating engineer by insisting that your jobs be insulated with Celotex. Your clients will appreciate the fuel saving and new year 'round comfort this insulation brings.

The word
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CELOTEX
BRAND
INSULATING CANE BOARD
ROOF INSULATION

THERMOMETERS, RECORDING AND INDICATING

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York, N. Y.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill
Sarco Co., Inc., New York.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Chadeayne, Geo. D.,
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co, Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Watts Regulator Co., Lawrence, Mass.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, VACUUM RELIEF

Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
National Regulator Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

WRENCHES, STILLSON

Walworth Co., New York.

ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster Talmadge, New York.

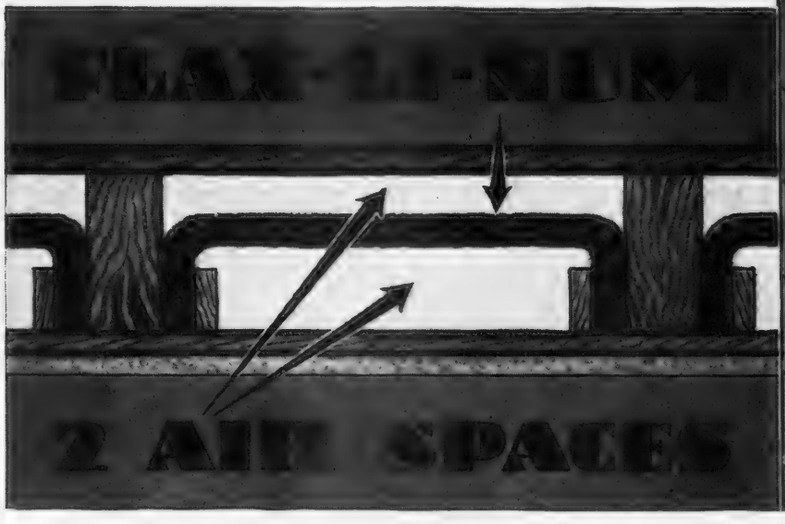
THE FLAX-LI-NUM TWO-AIR-SPACE METHOD OF . . . INSULATION IS 50% MORE EFFICIENT IN PREVENTING HEAT LEAKAGE

FLAX-LI-NUM stops heat leakage. It is a single purpose material and can be used for insulating purposes only. It was not meant to be used otherwise for it is an accepted scientific fact that when insulation is combined with other steps in construction, there is an actual loss in insulating efficiency. FLAX-LI-NUM was not designed to lose insulating value . . . It was designed to gain it . . . to make possible greater comfort, protection and economy from an economical thickness of material. Hence, the two-air-space method of application.

According to the U. S. Bureau of Standards Letter Circular No. 227, "The addition of a half-inch layer of insulation in the middle of the air space in a frame wall is therefore the equivalent of adding about a three-quarter inch layer at some other place in the wall." Obviously the FLAX-LI-NUM two-air-space method of application is 50% more efficient in preventing heat leakage.

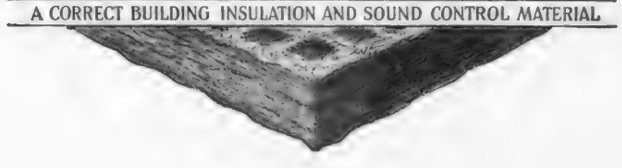
FLAX-LI-NUM is quite generally accepted as the outstanding building insulation . . . when insulation is the result that is desired. Chances are it will always maintain that fine position for the principles behind it are scientific and unchanging.

FLAX-LI-NUM INSULATING CO., *St. Paul, Minn.*



Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



FLAX-LI-NUM INSULATING CO. HV-11
St. Paul, Minnesota

Send me complete information about Flax-li-num. Also facts about the 2-air-space method.

Name.....

Address.....

City.....

State.....

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Showing pulley side of Tentacular

"TENTACULAR"

Important Announcement

We have developed a new type of Tentacular belt which we guarantee to be noiseless and free from stretch.

If you are interested in high efficiency at small cost, nothing will equal Tentacular for the transmission of power on short centers and high speed ratios, also for high speed drives.

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General Office and Plant: 14 South St., Philadelphia, Pa.

Branches
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ATLANTA, GA.

Distributors in all Principal Cities

Branches
NEW YORK CITY, N. Y.
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"Sole Makers of Tentacular Transmission Belt"

Please visit our exhibit, Power Show, Booths 269-270, Grand Central Palace, New York City, Dec. 2nd to 7th.

STIRLING TOWERS, Toronto
(827 radiators)
CHAPMAN & OXLEY
Architects
YOLLES & ROTENBERG
General Engineers and Contractors

ILLINOIS
HEATING SYSTEMS
in Canada

An ILLINOIS Heating System installed in this up-to-the-minute office building (Stirling Towers, Toronto), is giving positive heat in cold weather and mild heat in mild weather, without overheating—and is saving the fuel which overheating uses.

ILLINOIS Systems combine the advantages of quick and positive steam circulation, easy control of room temperatures, noiseless operation, durability of apparatus, fuel economy (approximately 1-3 over ordinary systems), and a minimum of operating expense.

ILLINOIS Systems are balanced systems. All valves and specialties are of Illinois manufacture, and designed to operate as a unit. This offers great advantages over assembled systems made up of specialties of various manufacture and design. It also gives unified responsibility and guarantee.

ILLINOIS Heating Systems have long demonstrated their worth with a record of dependable performance in thousands of America's finest buildings of every type. Think of this in terms of client satisfaction.

Write for Bulletin 22

ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD, PRES. INCORPORATED 1900
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

A complete description of ILLINOIS Vapor Systems is given in Bulletin No. 22 which really should be in the reference file of all who have to do with the Heating of Buildings. Your copy will be sent upon request.

Toronto Representative: Paul E. Cleal, 114 Jarvis Street

In Dynamic Detroit the trend is to Marsh Heating Systems

Dynamic Detroit is following the lead of other cities all over the country in the selection of Marsh Heating Systems for its big buildings.

The Detroit Leland Hotel is one of the recent buildings for which Marsh Systems have been chosen. The reason for this preference lies unquestionably in the all-'round, superior performance of the heating systems and specialties produced by Marsh—for nearly 65 years a leader in this field.

DETROIT LELAND HOTEL

Rapp and Rapp, Chicago, Architects; Lundoff Bicknell Construction Co., Cleveland, Ohio, General Contractors; Pittlekow Heating and Engineering Co., Detroit, Heating Contractors.

LISTED BELOW ARE SOME OF THE MARSH INSTALLATIONS IN DETROIT AND SURROUNDING TERRITORY:

Burns School
Penobscot Building
Auto Sales & Service Garage
Windsor City Market, Windsor, Ont.
Evans Theatre
Marquette Building
Marvington Apartments
Wolverine Enameling Company
First Lutheran Church
Mt. Clemens High School
Graham-Paige Motors Corporation
Blessed Sacrament Church and Rectory
Chrysler Corporation
Parker Rustproof Company
Briggs Manufacturing Company
H. J. Heinz Company, Leamington, Ont.
Burlingame Apartments
Fisher Body Corporation
Eclipse Machine Company, Walkerville, Ont.

Architects and Contractors are invited to send for Marsh bulletins and to avail themselves of Marsh Engineering Service.

JAS. P. MARSH & CO.

Division General Instrument Corporation

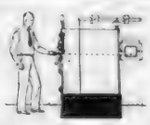
2073 Southport Ave., Chicago

551-5th Avenue, New York City
Bond Bldg., Washington, D. C.
Detroit Office: 1900 E. Jefferson Ave.

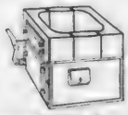
Other offices in Principal Cities

HEATING AND VENTILATING

The Weil-McLain Jacketed Boiler



Choke damper is controlled from the front of boiler.



Rounded "live fire" corners in the fire box.

Unusually high ashpit.

Analyze it for convenience, operating economy and scientific combustion

Trim, jacketed in enameled steel, symmetrical of line, the Weil-McLain Jacketed Boiler embodies a full measure of colorful beauty to harmonize with modern basements.

This jacketed boiler also embraces many convenience features. The choke damper is controlled from the *front* of the boiler. There is an unusually high ashpit. There is automatic draft regulation. Added combustion space and extra fuel-carrying capacity mean lengthened firing periods.

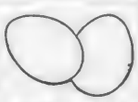
To avoid waste up the chimney, you find incorporated in this boiler the basic principle of more heating surface, particularly above the fire. The vital heating surfaces are in effect corrugated like this ~~~~, instead of flat like this _____. There is also a balanced back-and-forth fire travel, which cannot short cut to the chimney. The hot gases, under *all* conditions, must travel through *all* heating surfaces in the boiler.

You will find in this jacketed boiler, moreover, two distinct reasons for scientific combustion. First, all grates within the fire box are *shaking* grates; second, this feature, combined with rounded "live fire" corners in the fire box, assures a clean, bright fire at *every* point, and ends waste of fuel into the ashpit.

Other superiorities of this jacketed boiler are: Thoroughly insulated jacket, large flue spaces, generous water spaces, extra large lower nipple openings, outside tie rods, two washout plugs and a skimming plug, provision for hot water coil and indirect water heater.

There are Weil-McLain Boilers to meet all needs . . . Round Type, Jacketed, Self-feed, Square and Smokeless. Also Weil-McLain Radiators.

They look alike, but *are* they?



Be wise . . . analyze!

The Weil-McLain Line of Boilers has many sales features that remain hidden under casual examination. Analyze these features. They will surely help you close jobs—at a profit.

WEIL-MCLAIN COMPANY
General Offices: Chicago, Illinois
Boiler Factory: Michigan City, Indiana
Radiator Factory: Erie, Pa.

Weil-McLain
SCIENTIFIC COMBUSTION
BOILERS

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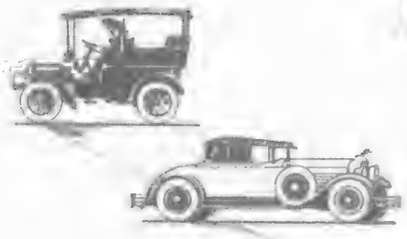
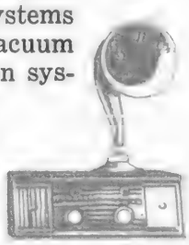
There's Money ..in this—

MODERNIZING BUSINESS--



It's in the air. People want *modern* things. They turn in their cars every year or two, for new, more modern cars. They do the same with their radio sets. They replace out-of-style clothes with new stylish apparel. Things a little bit out of date are banished nowadays.

Here's the point. There are a great many folks in your locality who ought to modernize their steam heating systems by replacing air vent valves with Hoffman No. 2 Vacuum Valves. By doing this they have a thoroughly modern system—virtually a vacuum system.



Ordinary vent valves are out of date. These people around you are exactly in the mood to act on this wise suggestion. Many heating contractors have proved it already, and have made money proving it. They have followed up the big Plumbing & Heating Industries Bureau "modernizing" campaign and the Hoffman No. 2 Vacuum Valve advertising, by *going after business.*

Their men carry Hoffman No. 2 Valves in their pockets. At every opportunity they talk to prospects and customers about modernizing and vacuum-izing their heating systems. If you haven't tried this you don't know how easy it is to get a whale of a lot of extra business.

Now is the time to start. Remind folks that cold weather is almost here. Talk Hoffman No. 2 Vacuum Valves. Tell them what it means in quick, extra heat and fuel saving.

If you'd like advice on how to start a Modernizing-Vacuum-izing campaign in your town, write Hoffman Specialty Company, Inc., Dept. C-56, Waterbury, Connecticut.

HOFFMAN
No. 2 VACUUM VALVES

The combination of a vacuum disc and a vacuum diaphragm is found only in Hoffman No. 2 Vacuum Valves. This *double lock* assures proper functioning for *many years.*

SUPPLEMENT TO HEATING AND VENTILATING, NOVEMBER, 1929

SPECIAL NEWS BULLETIN

STOCK MARKET BREAK WILL HELP BUILDING INDUSTRY, LEADERS REPORT

In order to interpret quickly the effect, if any, of the stock market break on the building industry, telegrams were sent Wednesday, October 30, to more than 200 representative manufacturers throughout the country asking for an expression of opinion. We print below as many replies as could be included before mailing the November issue of Heating and Ventilating. The opinion is widely held that through curbing speculative activity, money will be available for carrying out building operations on a large scale.

American Gas Ass'n.

In our opinion recent events on the stock market will result in lower cost of money, thereby making possible greater building activity heretofore deferred because of high cost of financing. Business conditions unquestionably fundamentally sound.

ALEXANDER FORWARD,
Managing Director.

Andersen Lumber Co.

Recent investigations that are personally made on extended trip indicates to me that low points of residential building have been passed. However, home buyers will be more discriminating than formerly and demand quality materials and workmanship more than ever before.

FRED C. ANDERSEN.

York Heating & Ventilating Corp.

Absolute soundness of basic conditions makes me feel release of money held in market by previous high call loan rates will allow buildings requiring mortgage money to proceed, and business should be as good or better than in the past two years.

THORNTON LEWIS, *President.*
Also *President* American Society of Heating and Ventilating Engineers.

Albert Pick-Barth Co.

Business on entirely too substantial a basis to be hurt. The lessening of demand for funds used for stock market purposes and the availability of money for business operations will certainly be helpful. Our program, calling for new branches and expansion as well as sizable increase in advertising appropriations, will proceed as heretofore planned. Stock market reaction healthy. Hope for quiet market with sensible recovery, so as not to again induce speculation. Too many salaried individuals endeavored to make their fortunes gambling, instead of old-fashioned effort through business pursuits. Re-establishing the principle of slow, steady, solid growth is one of the gainful effects. Certainly see no reason for pessimism.

RICHARD RATNER, *President.*

American District Steam Co.

From our viewpoint business was never on a more sound basis or country's credit facilities more stable. Our business exceeding expectations for this season of the year and future outlook never was brighter. The country has gone speculation mad. I believe present nervousness of minority purely psychological and that the stock market depression will soon be forgotten.

ROBERT HALL, *President.*

Trimpak Corp.

Replying your wire, last few weeks placements indicate retail stocks are so extremely low that the least volume of residential construction enforces buying. Recession in building construction last few months has decidedly improved antiquated methods of merchandising homes. If stock market drop releases money for mortgages to support this improved selling, we will expect marked improvement in business for manufacturers supplying residential construction.

HARRY J. STRONG, *Secretary.*

Creodipt Co., Inc.

Business is fundamentally sound and the stock market reaction will surely release funds for home construction. There is as much money in the country today as there was before the stock market slump, and we are sure many who have hesitated to invest their money in a home now realize money put into real estate can not be swept away over night. We are confident the building industry will receive great impetus as result of the leveling of stock market prices. Building material costs today are as low or lower than they have been for many years, and many will take advantage of present situation because stock market speculation certainly has become unattractive.

H. E. GOSCH, *President.*

Pratt and Lambert

In our opinion business conditions in the paint and varnish industry are very satisfactory. We anticipate good buying for balance of year. Dealers' stocks are small, with good turnover for spring. Business is splendid. Believe present readjustment of security prices will have beneficial effect on the building industry.

A. D. GRAVES, *President.*

Ric-wiL Co.

Our business indicates building industry going right ahead regardless stock market situation. We believe building industry is benefited by this readjustment of values which was inevitable and necessary.

C. GOTTWALD, *President.*

Richmond Radiator Company

The building and allied industries should be benefited more than hurt by the forced Wall Street liquidation of the past few days. Capital should soon be available for legitimate business, particularly for residential building.

W. G. LANGFORD, *President.*

James P. Marsh and Co.

Our sales and prospects booked will make the last quarter of 1929 the largest in the history of James P. Marsh & Company. Regard the readjustment of the stock market as stabilizing and releasing of funds for investment, with added impetus to building industry in all lines.

ORVILLE W. THOMPSON.

Peerless Unit Ventilation Co.

From our viewpoint as manufacturers of heating and ventilating equipment, we can see absolutely no reason for alarm because of the present stock market situation, which we believe is purely temporary. We are confident that our industries will not be affected in the least and are proceeding with our preparations for increased production and sales for 1930.

M. J. CALLAHAN, *President.*

Illinois Engineering Co.

Replying to your wire we believe the collapse of the stock market definitely ends the speculative wave which has engulfed the country and will prove a distinct benefit to the building industry, by returning funds from stock and call money operations to legitimate building projects.

ROBERT L. GIFFORD, *President.*

Skinner Bros. Mfg. Co., Inc.

See no reason for any worry. Business conditions better than last three years.

Whitlock Coil Pipe Co.

We have confidence in the stability of business and continued prosperity of the country. Recent developments have not shaken our belief in the fundamental soundness of the country's industries.

J. L. GOODWIN, *President.*

Watts Regulator Company

We view situation with absolute confidence. Business conditions are sound as a whole throughout the country. This we know, as our products are sold from coast to coast. We have received no cancellations during panic. We believe that with the sound business conditions that exist throughout the country that stock depression can not be of long duration.

McDonnell & Miller

We are just completing the biggest month in our history. The entire year so far has been ahead of all former years. Outlook and prospects for immediate future encouraging. We expect to go right ahead as we see no sound reasons for alarm in our industry.

E. N. MCDONNELL.

Heating and Piping Contractors National Association

I see no bad effects from recent panicky stock conditions for our industry, but on the contrary expect that there will be improved building conditions in near future.

HENRY B. GOMBERG, *Secretary.*

S. T. Johnson Company

The oil heating industry, now enjoying the most successful year of its history, is built on the foundation of modernization and efficiency, having graduated from the class of luxuries and will hold its place in all sound revaluation of the country's wealth and help in a larger, better building program that is coming in American business.

J. C. JOHNSON, *President.*

Armstrong Machine Works

Fundamental business conditions as reflected by our volume of sales to all classes of industry were never better than now. We see no reason why business should not go forward as usual.

Central Supply Association

While the correction of stock market has consumed the savings of thousands of wage earners the power to earn and save has not been greatly impaired. With credit released from stock market more funds will be available for building loans. Prices for plumbing, heating and other building materials are reasonable. Labor is ready to give a full day's work. Real estate, particularly homes and small apartment buildings, will soon be in greater demand.

W. E. MCCOLLUM, *Secretary.*

H. A. Thrush & Co.

We have confidence in the future of the building industry in this country. Liquidation which is taking place in the general stock market will, in our opinion, make for more favorable financing in connection with the building industry generally.

President.

Vilter Mfg. Co.

Despite the decline in paper value of various stocks business seems, from our point of view, to be on a basis essentially sound. We record no cancellation of orders nor is there anything in the situation which makes us fear for continued prosperity of business in general.

The Cleveland Gas Burner and Appliance Co.

The fundamental business conditions of the country today are absolutely sound. Manufacturers of heating and home building essentials can now justly look forward to an improved condition brought about by the unfortunate stock market crash, which will now cause the general public to invest in home building, instead of gambling in the stock markets. Extravagance in the purchase of unessential commodities and luxuries will be somewhat curtailed. There is absolutely no cause for alarm.

HARRY E. KERR, *President.*

General Air Filters Corporation

Am viewing the stock market situation with satisfaction and confidence. Speculation will be discouraged and shortly will revert to investments and trade channels, such as the building industry with its allied market.

JOHN HELLSTROM, *President.*
Midwest Air Filters, Inc.

Carrier Engineer Corp.

Contracting as we do with hundreds of manufacturing industries as well as with those who are responsible for public and private building expansion, the economic situation in the country appears to us to be on a most sound and rational basis. We are in no way alarmed by present speculative readjustments. We are not retrenching, but are expanding to meet the healthy growth of national and international commerce.

Hess Warming and Ventilating Co.

The building industry has been severely hurt by not being able to compete for money with stock speculators. Also surprising how many persons have had their minds taken away from their regular work by speculation. Now that people realize there is no more easy money, we look for more attention being paid to normal affairs, with very much less expense in getting building loans. This cannot but help the building industry.

Walworth Company

Incoming orders at all Walworth plants for October exceed September and there is no sign of a let-up. Every factor points to a fourth quarter showing in line with the steady improvement in earnings which the company has made throughout the year. Third quarter statement will be ready for publication within the next few days. Cheaper money should be favorable to the building industry.

HOWARD COONLEY, *President.*

Ramp Building Corp.

We think that present activity will not only continue but show very substantial increase in construction for 1930. The recent stock market slump has released funds which will be available for building finance and other legitimate purposes. We look for a great increase in multifloor garage construction in 1930.

FRED W. MOE, *President.*

Rome Brass Radiator Corp.

The business situation in this country is not made or destroyed by conditions in the security market. Prosperity does not depend on the price of stocks. Fundamentally, the business structure of this country appears as sound as at any time in history. What we need is more sound thinking, a return to productive work, and less speculative hysteria. Our own business is steadily showing a very satisfactory increase over last year and we can see nothing in the immediate future to seriously jeopardize either prospective operations or carnings.

When the present speculative obsession ceases—as we believe it soon will—we feel conservative, sound thinking investors will put their money into high-class building investments, one of the safest securities possible.

JAMES D. ERSKINE, *President.*

Nash Engineering Company

Replying to your telegram, indicattions point to continued fine business.

IRVING C. JENNINGS, *President.*

Holophane Co.

Believe economic situation nationally absolutely sound, although perhaps temporarily somewhat affected by recent stock market. Our business unimpaired so far and 50 per cent ahead of last year. As an expression of our confidence in the future, we are right now increasing factory capacity considerably.

CHARLES FRANCK, *President.*

Copper and Brass Research Association

We feel that a large volume of building construction will be maintained for the remainder of this year and through 1930. While some falling off may occur, especially in residential building which has been extremely active during the past few years, no general or marked depression is anticipated.

J. L. Wing Mfg. Co.

Believe building and allied industries will be affected favorably rather than otherwise. Nothing has happened to change sound industrial conditions and anticipate a very satisfactory 1930.

A. E. SEELIG, *President.*

General Cable Corp.

We view present situation in our industry with entire confidence and believe funds will be readily available for building operations next year. Stocks of goods are comparatively small and prices in our particular branch of the industry have not been inflated.

H. Y. DYETT, *President.*

Detroit Steel Products Co.

Fundamental business conditions excellent. Believe outlook for future business improved by recent stock market stabilization. Credit will be diverted into business that will be of permanent value.

V. F. DEWEY.

Cohoes Rolling Mills Co.

Your telegram received. Believe continental condition never better and prospects for same good. Business exceptionally bright.

Steel Frame House Company

Our survey shows excess of families over dwellings has increased yearly from about 10 per cent in 1900 to about 17 per cent in 1929. This condition and with loaning institutions looking with favor upon more liberal financing on good construction, we believe that conditions are sound for increased activity in the building industry.

E. H. MILLARD, *President.*

Cassard Romano Co., Inc.

Replying your wire we are not at all alarmed at situation and are convinced that business will continue at satisfactory level.

MORRIS CASSARD, JR., *President.*

Kittinger Co.

We view the future business outlook with utmost confidence. The present deflation and stock values is a natural economic change. Stocks should revert to their true earning value to make business conditions sound. We are preparing for a good business year in 1930.

FRED J. BATSON, *Vice-President.*

The Duraflex Company

Business unquestionably sound fundamentally. Our outlook very good. Consider stampede foolish as always.

Servel Inc.

Recent happenings in stock market will have sobering influence on trading and perhaps to some extent on business, but we believe the fundamentals of the present business structure are sound and view with confidence the prospects for 1930 business.

FRANK E. SMITH, *President.*

Philip Carey Mfg. Co.

We believe in fundamental soundness of business. There is ample credit and money in the country to carry on, therefore feel entirely optimistic as to the future.

G. D. CRABBS, *President.*

Brasco Mfg. Co.

Our faith has not been destroyed. Industry is fundamentally sound. Stocks will promptly adjust themselves to fair values. In meantime more money will be available for building than ever before. We view outlook optimistically, feeling confident our own business will continue at present or even greater rate of growth.

The American Hdwe. Corp.

We believe that fundamental conditions are so sound that the building industry will not be materially affected by the decline in the price of stocks. It is even probable that after the financial interests have adjusted themselves business conditions in our industry may be improved by the release of money and credit for construction heretofore otherwise employed.

GEORGE T. KIMBALL, *President.*

Sargent and Co.

In our opinion decline in stock market will have a favorable result on business over a long range period. Credit and funds which have diverted into stock speculative channels will be available for business projects, including building operations.

MURRAY SARGENT, *Secretary.*

Aluminum Co. of America

Our contacts with the building and other industries lead us to believe that fundamental business conditions are sound. Temporary or local setbacks may occur this fall or in 1930, but business as a whole should move forward.

ROY A. HUNT, *President.*

Heatilator Company

The desire for modern homes provides a ready market for the conservative, efficient builder. The prospects of easier financing indicates more home building by owners and developers. Heatilator values, present and prospective, very satisfactory. Inquiries looking to next season's building largely in excess of any previous period.

W. E. JAQUITH, *Secy. and Treas.*

American Telephone and Telegraph Company

In response to your inquiry the business prospects of the Bell Telephone System are as good as they ever have been and we look for continued growth and expansion.

WALTER S. GIFFORD, *President.*

C. A. Dunham Company

Industry within our observation evidences a healthy contrast to the present stock market condition. Fundamentally all is well. Stock prices will balance with earnings. Bonds for construction purposes will again be sought by the conservative investor.

C. A. DUNHAM, *President.*

Jenkins Bros.

Replying to your telegram October 30th, during the past two weeks we have secured a very satisfactory volume of business in valves for new construction, with prospects of a continuance of the good business we have enjoyed during this year.

Consolidated Ashcroft Hancock Co., Inc.

Our close contact with nearly every industry throughout our country is such that we feel no hesitancy in stating our belief that industry is on a very sound basis and will continue to show satisfactory progress.

Berger Mfg. Co.

We believe the building industry for the balance of this year will be normal in every respect. Indications show prospects for an excellent building year in 1930, with stability of the building industry practically assured.

BUILDING DIVISION.

The Trane Co.

Believe present business situation most promising and that market adjustment opens the way for real building next year. Present year has been good and will continue.

REUBEN N. TRANE, *President.*

The American Laundry Machinery Co.

Answering your telegram of this date, our judgment is that general business will not be affected by present stock market action, particularly if it results in easier money, thus freeing capital for constructive and expansive purposes. We have every confidence in immediate future and are conducting our business accordingly.

L. Sonneborn's Sons Inc.

We believe the happenings last few days have been a necessary corrective operation. The ultimate effect on legitimate industry and business can only be beneficial. In our organization we are looking forward with every confidence to continued good business.

DR. FERDINAND SONNEBORN,
President.

Hoffman Specialty Co., Inc.

We consider the present somewhat demoralized condition only temporary. Inflation reached its limit and we now have swung to the opposite extreme. The next step will be into the conservative midway, where the stability of country-wide business will quickly assert itself. We look forward to continued prosperity on a safe and sane basis.

W. K. SIMPSON, *Secretary.*

Fulton Sylphon Co.

This has been one of the best years in the history of this company and there is no basic reason why business should not continue on the same satisfactory basis.

Raymond Concrete Pile Co.

We have the utmost confidence in the fundamental soundness of American business and in the judgment and resourcefulness of American executives as well as in the most wonderful national resources of the country and in consequence can only look forward to the continuation and growth of all sound enterprises.

HARRY R. MOYER,
Vice-President and Treasurer.

Kerner Incinerator Co.

We feel let up in residential building which country has been experiencing this year has been decidedly beneficial. Over built conditions are disappearing, and we look for a marked improvement in building starting in spring. From our standpoint fundamental conditions have never been more sound.

MACKAY WELLS, *President.*

Carter Bloxonend Flooring Co.

Believe stocks generally still much above actual value, too much money and credit is tied up in them. When market finally approximates normality for which it now seems headed, funds for real constructive work will be available and business will improve. Our observation is that it is generally good now.

David Luptons Sons Co.

Present stock market conditions should have little or no effect upon legitimate business. Sound values are not affected. We find no hesitancy in buying market or industrial building.

Truscon Steel Co.

We believe real estate and building situation will necessarily benefit by recent debacle. Losses have not been occasioned to substantial industries, nor have banking houses or investment institutions suffered. Undoubtedly these will gain tremendously at expense of speculating public. It is unlikely securities will appreciate as heretofore, making cheap money available and stimulating investment for building purposes. We have enjoyed the busiest year of our existence and even despite present market difficulties our volume is keeping up splendidly.

JULIUS KAHN, *President.*

Brownell Company

The country is in a more prosperous, safer and industrially sounder condition than it ever has been before and see no ground for uneasiness about fundamentals of prosperity.

J. R. BROWNELL, *President.*

Standard Conveyor Co.

Our barometer of future sales is the present amount of proposals or work on which we are figuring. There is more work in prospect for us right now than at any other time in our history. The increase or decrease in business that we may have is largely dependent upon our own individual efforts. We believe any decline or postponement which may result from recent stock activities will be temporary and slight.

H. L. DONAHOWER, *President.*

American Face Brick Assn.

Replying your wire 30th, building situation should be materially improved by lowered interest rates and more plentiful mortgage money which may now be reasonably expected. No general overbuilt condition exists and normal demand for new structures, coupled with desire for better housing, should soon bring renewed construction activity. Dissatisfaction with out-of-date homes and offices promises to result in increasing volume of both modernizing and new building, and may become very important factor in construction field.

GEORGE S. EATON, *Secretary.*

W. M. Ritter Lumber Co.

Answering your wire, industry generally, which of course includes the building industry, is fundamentally sound. The wild orgy of speculation on the stock markets is past. The vast sums of money that were diverted from legitimate business during the stock speculation period will find their way back into legitimate trade and industry and this must be extremely beneficial to the building industry. With the collapse of the stock boom an era of sanity will return. Men will regain their pose and be content to turn their minds and money into normal business channels. We view the future of the building industry from this time forward not only with confidence, but with genuine optimism.

W. M. RITTER,
Chairman of the Board.

Structural Gypsum Corp.

If we keep in mind that the recent stock market hysteria has produced a collapse of prices but not of sound values, there is no basis for a lack of confidence in the continued prosperity of the country's basic industries. On the contrary, money heretofore diverted into speculation should now begin to find its way back into and stimulate legitimate business. I feel that this will be especially reflected in the building industry, releasing many projects which for the past year have been held up through inability to finance except upon unsound basis.

G. LESTER WILLIAMS, *President.*

Atlas Portland Cement Co.

Answering your message the liquidation in stocks has in no way affected our confidence either in our own industry or in other sound enterprises. On the contrary, we believe that building and mortgages which at one time seemed unattractive will again come into their own. The fact that foreign cement is allowed to come into this country free, to compete with our higher costs owing to high labor, prevents my looking for a successful period in that particular line until the tariff question is remedied as we hope it will be.

JOHN R. MORRON, *President.*

Indiana Limestone Company

We believe the building industry shows good prospects for the coming year. With a large government program and state municipal railroads, banks and other corporations, building programs the largest in the history of the country. The slackness has been due to the falling off in smaller work such as small residences, apartments, etc., but feel that this work will improve on account of money being taken out of the stock speculative field and placed in good mortgage bonds. We have orders for a larger amount of fabricated work now than ever in the history of our business and are very optimistic for the future.

A. E. DICKINSON, *President.*

National Lead Co.

The reaction to the extreme speculation rampant both in the United States and Europe was logical and necessary and conforms to what any student of economic laws anticipated. The result should be a reduction of credits with corresponding decrease in current interest rates, which should be beneficial to the building industry.

EDWARD J. CORNISH, *President.*

Shevlin Carpenter & Clarke

My personal view is that the lumber industry and the building industry generally will, in the very near future, benefit by the liquidation of the stock market. Our lumber business began slowing down about six months ago, due largely to the fact that the capital of the country, to a great extent, was in demand at high rates to maintain fictitious stock market values. The result of this was curtailment of funds for building purposes and a sharp decline in building permits throughout the country. We are still under-built in the United States and it is evident already that capital will soon be available at reasonable rates for a building program. I look forward to 1930 with confidence.

E. L. CARPENTER, *President.*

Congoleum Nairn, Inc.

Answering telegram, we believe general business in this country fundamentally sound and look forward to continued good business in the future. Congoleum Nairn, Inc., volume and profits for each quarter this year has exceeded corresponding quarter last year. Stock values do bear a definite relationship to earning power, but this fact has been disregarded in a hysteria of inflation in some stocks which were bound to crash and temporarily carry all stock to a much lower level. The good ones will rebound to their true market value and the poor ones will have a hard time. Stock losses may temporarily affect business, but so long as business fundamentals remain sound and general business is guided by scientific budgetry and inventory control as is generally the case in the modern business in this country, I seriously doubt that progress and prosperity in the United States can be stopped. For the long pull the optimist in this country has always had the laugh on the pessimist.

HAWKES.

Richardson & Boynton Co.

The Institute of Boiler and Radiator Manufacturers feels that the fundamental condition of the country is sound and that the building industry may have its ups and downs, but that the increased population year in and year out leads us to believe that the building industry must continue to increase. We look forward with confidence to a good year in 1930 with the funds released from the market to be put into the construction of homes.

H. T. RICHARDSON, *President.*
Also *Chairman* The Institute of Boiler and Radiator Manufacturers.

Curtis Companies Incorporated

Liquidation in stock market has opened way to building of houses by releasing capital which will find its way back to mortgage market in good time in most communities. Surplus of houses is fast disappearing if not already converted into a shortage and with prospects distinctly good for lower money rates, I regard this as especially good time for commencing new house construction. With excellent reason expect that beginning next spring we shall have more active demand for building materials than since 1925. Recovery in security values yesterday indicates no lack of confidence in business situation which is, in my opinion, perfectly sound.

G. L. CURTIS, *President.*

The Casement Hardware Co.

As far as stock decline goes feel necessary corrective long overdue and that it will help legitimate business and construction industry although immediate effects may be adverse until situation is readjusted. Consider only one important factor now unsound —and that is government position in grains, which if maintained will cause the same inflation as in stocks with artificial barriers against natural corrective forces of supply and demand. Our company now enjoying largest and soundest business in its history and planning confidently on further progress next year.

C. E. SPENCER.

The American Rolling Mill Co.

Commerce and industry have made splendid progress during the past five years. They are still going strong and minus seasonal and other temporary fluctuations, they will always go strong. The steel industry has enjoyed an outstanding year without any inflation in price. Profit has been made from good volume and reduced cost. In this great and growing country with its boundless human and material resources industry must continue to grow steadily. Future business prospects and opportunities were never better than today.

GEORGE M. VERITY, *President.*

Bagues Inc.

Our business is perfectly sound and the prospects very encouraging.

President.

General Refrigeration Co.

Facts indicate a splendid soundness of the country from both business and financial standpoints. Business well ahead of last year and we believe will continue in goodly volume. Business in general already transacted this year to date places 1929 in the catagory of 1927 and 1928, which are conceded banner years. We have full confidence in the continuance of these good business conditions.

JAMES R. MORASH,
Vice-President.

Dahlstrom Metallic Door Co.

Most building projects of any magnitude already projected are too far advanced to be influenced by any purely temporary readjustments of the general public finances, therefore we are confident that the present stock market condition will have very little effect upon the larger building operations throughout the country such as those we are interested in. In fact, this experience may tend to turn the financial current into more creative channels and in the end serve a useful purpose.

H. E. V. PORTER, *President.*

National Fire Proofing Co.

Your wire of even date has been received. Orders received would indicate that October will be a banner month for us thus far during the year. Present bookings carry us well into the first quarter of 1930.

The United States seems large and progressive enough to absorb shocks and dissipate them, serious though they may be for the time being.

S. F. HERBERT, *President.*

National Lumber Mfrs. Assn.

All our information indicates that industry and trade are in an intrinsically sound position outside of the psychological effect of the stock market crash which of course is entirely conjectural. We are inclined to the belief that the return of the stock market to stability and reason will be good for the productive and construction industries which undoubtedly have suffered from excessive diversion of the nation's liquid capital to the stock market whether as loans or speculatively. We would not be surprised if the construction industry should improve on account of rather than despite the stock market debacle.

WILSON COMPTON,
Secretary and Manager.

Fiske & Company, Inc.

Our opinion is that the volume of building particularly of the better types will increase during nineteen thirty and that more money at reasonable rates of interest will be available for this purpose.

H. T. FOLSON, *President.*

Black & Decker

We are optimistic as we believe stock market situation will not adversely affect general business. General business is healthy, inventories low and money for business will be more plentiful, and most important of all more people will go to work and stop speculating.

S. D. BLACK, *President.*

Ambler Asbestos Shingle & Sheathing Company

There is nothing fundamentally wrong with the present business situation. A number of persons have sought to get money without rendering an equivalent for it and have guessed wrong to their own discomfiture. That is all.

RICHARD V. MATTISON, M.D.,
President.

The Wheeler Osgood Co.

Developments of the past two weeks prompt us to look forward with confidence to marked improvement during next year in the building industry. We do recognize the tremendous producing capacity that has been built up and believe to secure fair returns on capital invested manufacturers of building materials must cooperate through trade associations to legally regulate production to demand.

W. E. Dunn Mfg. Co.

Ships like the building industry don't go down in seven squalls. Buyers will merely be more discriminating, seek better values. Right production methods with automatic machinery will lower manufacturing costs. This confidence in future makes us rush completion of new machine which will halve brick costs.

W. E. DUNN, *President.*

The Master Builders Co.

Stock market panic has not changed our views of business in United States of America. Survey shows fundamentally sound condition of our industry at this time. Prospects of easier money promise improvement in construction field ahead. Have every confidence in future.

S. W. FLESHEIM, *President.*

Wasmuth Endicott Co.

We look with complacency upon the prospects in the building industry. The panic in the stock market just receding will have little, if any influence upon the earning capacity of industry. Legitimate business will quickly resume its normal trend. Responsible builders will find money more plentiful for their operations and at lower rates, and the building program for next year should be very much larger than that of the past twelve months.

E. M. WASMUTH, *President.*

Dewalt Products Corporation

We have confidence in American ability and resourcefulness. Every crisis in past has been 90% hysteria. We are proceeding with our plant expansion plans affording greater facilities. We believe in continued prosperity and continuing advance of successful commerce. Our people have been educated to high standards of living in beautiful modern homes and industrial plants affording every convenience and will not be content to revert to pre-war status.

PAUL GARDNER, *President.*

Insulite Co.

The Insulite Company views the future with great confidence. We consider the business structure of country in splendid condition. People all over the earth are realizing the economic necessity for insulation. We are now preparing to build new mills at home and abroad to meet this rapidly growing demand. The building industry is prosperous and will continue its forward march.

SEYMOUR W. BACKUS,
Vice-President

Acme Brick Company

Answering your telegram we believe present situation healthy and necessary, provided it brings an end to the era of recent years of inflation of securities and other abuses which necessarily follow such a period. We believe our business and other businesses of the nation will again prosper when the people get their minds off of profits from inflation of securities, and direct their energies toward their own productive efforts. We therefore view the present situation without fear and with the utmost confidence that good sense will prevail and that prosperity will reassert itself, based on hard work and clear thinking on the part of the American public.

W. R. BENNETT, *President.*

Toch Brothers

In a business career of fifty years I have lived through three panics, in none of which have the businesses of this country been less affected than in the present one, which, to my mind, is just a localized storm particularly affecting those who wanted something for nothing. This panic is in a class of its own and has absolutely no bearing on merchants generally throughout the country, nor is it a money panic. Therefore, to my mind business will continue prosperously, as it has continued right along. Legitimate merchants, whether they be manufacturers, importers, or dealers, are being and will continue to be supplied with the necessary funds to conduct their businesses. There is no occasion for alarm or fear. Let every man make his own business his real business.

HENRY M. TOCH, *President.*

Federal Cement Tile Company

Dodge Corporation reports contracts awarded first nine months of 1929 equal to years 1925, 1926 and 1927. This is borne out in our own industry, where new production, shipment and erection records have been hung up. We will finish 1929 in full production and have a good start for 1930. The purchasing power in this country is so great that this, coupled with its increasing export trade, will carry it on an even keel indefinitely.

I. H. FREUND, *President.*

Cellized Oak Flooring, Inc.

We anticipate decided increase in building construction as a result of stock market fiasco, as much needed construction will now go ahead due to expected diversion of funds from call money to savings accounts and building construction. Our sales force now particularly enthusiastic about near future possibilities in our line.

A. O. CUTHBERT, *General Mgr.*

Portland Cement Association

The construction industry finds no cause for alarm in the recent market crisis, because of the ample stocks of high grade materials available at fair prices and with money both plentiful and cheap. Contractors are in excellent position to capitalize their skill and to profit from well planned merchandising. The opportunities inherent in winter construction should be recognized with results certain to be beneficial to every phase of building industry from architecture to labor.

WM. M. KINNEY, *General Mgr.*

Speakman Company

In view of the present situation it is hard to make any statements with confidence that might be borne out by later events. Views I have gathered the last day or two, however, show that eventually money would be released, which would later go into the financing of the building industries. I hope this is true. If this is the case, next year, at least, should promise some fair business.

WILLIAM A. SPEAKMAN, *President.*

The Eagle Picher Lead Co.

For some time the one weak spot has been the stock market. It has been a hindrance to business in many ways. High money rates have retarded building operations. While the cure has been painful, there is no doubt we are on a firmer foundation. It is possible the volume of new buildings may be lower for a time, but this can be offset if we can better sell the American people on the value of improving and modernizing their homes and properties. If this is done in a systematic way it will be possible to lift the building industry to higher levels than ever.

A. E. BENDELARI, *President.*

James B. Clow Co.

That the country has safely passed through the present crisis is the best evidence of its soundness and indicates that the future holds even greater rewards for those who have confidence. The building industry should eventually prosper as a result of this shakedown indicating as it does that for security one must be satisfied to grow with the country and receive only a reasonable return on investment.

WM. E. CLOW, *President.*

Concrete Steel Company

It is my firm belief that a readjustment in the stock market, such as has taken place during the past month, will eventually materially benefit the building industry. There is no doubt but that the capital of the country has been attracted to Wall Street by the lure of quick profits.

Since the recent demonstration of how insecure such profits have been, capital now will seek real investment channels instead of speculation. The eradication of the gambling mania which has recently taken hold of the public will undoubtedly help general business and especially the building industry. Therefore, I believe those in the building trade can look forward to a resumption of normal business during the coming year.

W. H. POUCH, *President.*

American Institute of Steel Construction, Inc.

Structural steel during 1929 has been selling in a volume greater than for last year, although the total of all construction has declined.

From information that comes to us we anticipate an even greater volume of steel construction during 1930. Much of this work has been held in abeyance by the drainage of money from outlying communities to Wall Street. The speculative deflection has been salutory to business. We believe that it will be a decided benefit to the structural steel industry as we can now go ahead on projects, the financing of which has heretofore been delayed.

CHARLES F. ABBOTT,
Executive Director.

Kawneer Co.

Our volume is above normal for this season, we expect the usual amount of business during the fall and winter. Stock market fluctuation has not as yet been a vital factor in our industry. However, millions now released should be available not only for us, but for the building industry in general. We are optimistic as to future activities. We are makers of metal store fronts, doors, windows and mouldings.

FRANCIS J. PLYM, *President.*

The Frink Corporation

Based upon our judgment of the outlook in the lines of business with which we come in contact, we consider the recent severe shrinkage in values of securities throughout the country to be very excessive, largely unwarranted and not as correctly indicating the future course of such businesses. These businesses seem to us to be in sound condition and we believe that they will continue for some time to be profitable to companies properly operating in such lines.

J. A. C. JENSEN, *President.*

Frederic Blank & Co.

We believe the readjustment of the market will have a salutary effect in the building trades. Funds formerly engaged in speculative ventures are being released for sound investment, with the result that building will profit. We look to the future with optimism.

Schlage Lock Co.

Our business in excellent shape with market widening steadily, and we look forward to a most prosperous future.

CHARLES KENDRICK, *President.*